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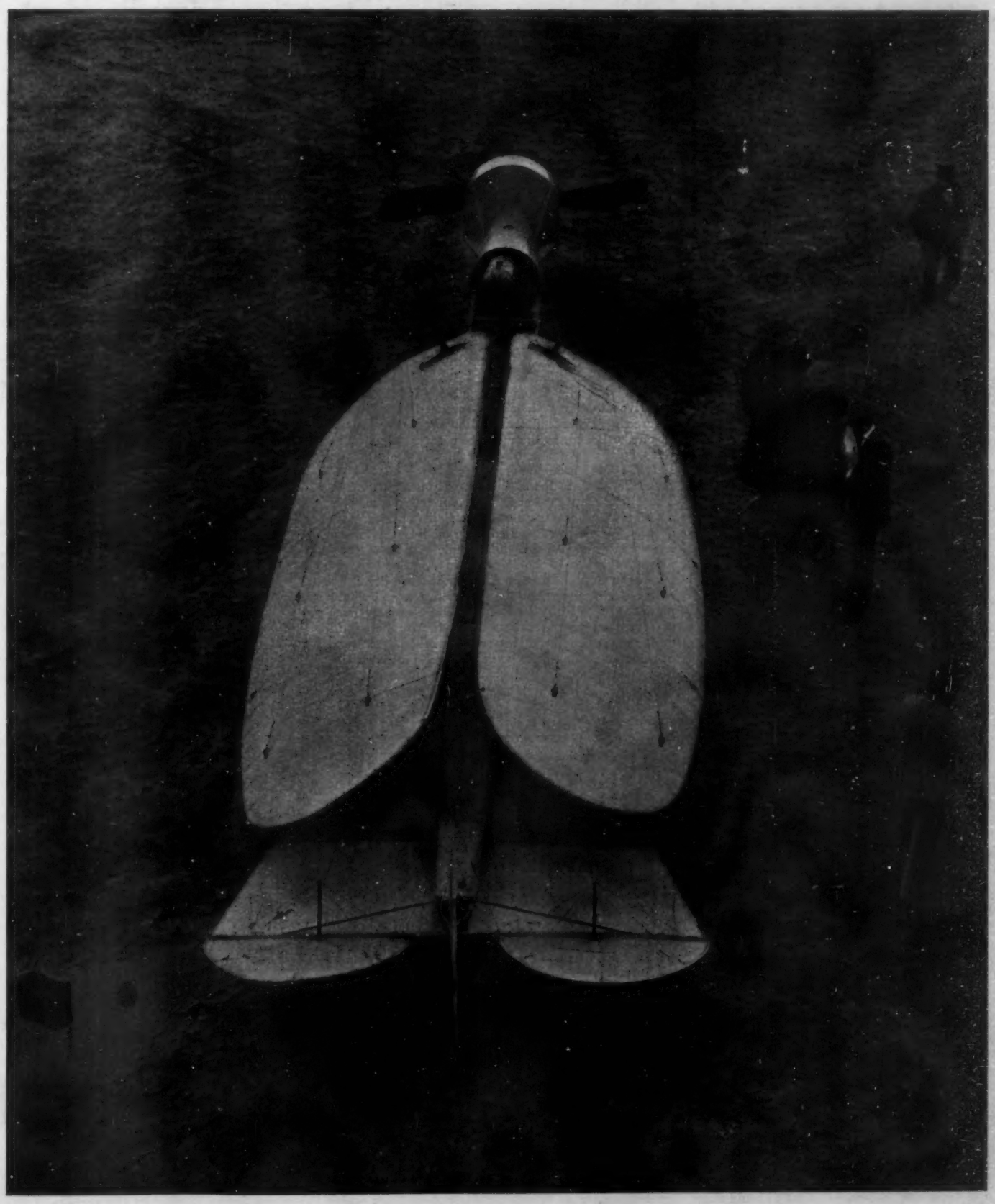

THE "BEETLE"—A NEW FRENCH MONOPLANE WITH TURNABLE WINGS.—[See page 397.]

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The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

The purpose of this journal is to record accurately, simply, and interestingly, the world's progress in scientific knowledge and industrial achievement.

The Patent Bills

WHILE we are in hearty sympathy with any intelligent effort to improve our patent system, and while there are many features in the patent bill which has been simultaneously introduced in the House and in the Senate that commend themselves to us, we cannot but feel that any legislation which will profoundly influence the policies of American manufacturers and inventors should not be decided upon until the whole patent situation has been painstakingly studied. Not many weeks ago we called attention in these columns to the admirable plan of the Inventors' Guild, a plan which involved the appointment by the President of the United States of a commission of competent men to inquire into the operation of our present patent laws, to report upon them and to recommend legislation which would cure the defects inevitably brought to light. Such a commission would be comparable with the bodies that the President has appointed to study the tariff question and other important matters. Without careful investigation much harm may be unwittingly done to manufacturers who have invested millions of dollars in patented machinery. The very legislation now proposed shows how necessary is the appointment of a commission to inquire scientifically into the operation of our patent laws; for the bill that has been introduced, while good in some respects, contains many a phrase that obviously does not express the intention of the framers and that would ultimately involve much laborious consideration on the part of the Supreme Court of the United States.

Some provisions in the bill need consideration. Why should not knowledge or use of an invention in a foreign country be a bar to the granting of a patent in the United States? Why should the present oath be tampered with? Why is the filing fee to be paid to the Government increased, in view of the fact that the Patent Office on the old basis has turned into the United States Treasury several million dollars? Why should a patent issue three months after the payment of the final Government fee, instead of four weeks as at present? Why should an interference proceeding determine once and for all the validity of claims? Why should an interference proceeding determine the validity of claims at all? Why should it not be limited, as at present, to the mere establishment of priority as between the parties thereto? Why should the Commissioner of Patents, when a case is appealed from the Board of Appeals to the proper court, be required to reveal the "grounds of his decision" against an applicant, when the record itself states the grounds? These are but a few of the many questions which a careful study of the bill inevitably raises in the mind of any patent lawyer.

There can be no doubt that patent attorneys should be competent men, and that they should give evidence of their competence. But why should they be subject to an annual tax in the manner proposed by the bill? What State levies a tax on members of the bar, or, indeed, of any profession?

No one will question the wisdom of requiring a patentee who secures his patent without the payment of fees to permit the United States to use his invention without the payment of royalty. But why should any citizen in the United States have the same right to appropriate the invention, as the bill now contemplates?

Unquestionably the Selden and Berliner cases, which dragged along wearily in the Patent Office for many years, are responsible for that section of the proposed law which seeks to prevent the juggling of amendments, so that the granting of a patent can be delayed at the will of the prosecuting attorney. That particular defect in our patent system should have been corrected long ago. The remedy proposed, however, is not likely to be welcomed either by inventors or attorneys. It is the intent of the bill to limit a patent from the date of filing the application, and to provide a period of two years, exclusive of the time consumed in the Patent Office and the courts, so that a patent shall expire within nineteen years from the date of filing. As it stands, the paragraph is difficult to understand. It first positively provides that the patent shall in all events expire nineteen years from the date of filing the application, but it excludes the time actually consumed by the Patent Office and the courts in considering the application. The provision relating to its expiration at the end of nineteen years seems to be entirely nullified by the provision for the exclusion of the time consumed in considering the application, both by the Patent Office and the courts. No doubt it was the intent of the framers to allow two years time in the aggregate, to the applicant, to prosecute his application *ex parte;* but if that was their intent, they have concealed it effectually.

A provision of the bill which deserves praise is that intended to prevent a continuance of the obnoxious practices of many advertising attorneys. According to the bill, attorneys must hereafter submit to a Board of Censors all pamphlets, circulars and advertisements relating to patents. The "no patent, no pay" type of attorney, whose deceitful announcements of rich prizes that can easily be won by inventing some trifle, whose "List of Inventions Wanted" has misled many a gullible inventor, will be driven to the wall, if that section is impartially enforced. Patent attorneys, however, should not sit on the Board, as the measure contemplates. The Censors should be selected from the staff of the Patent Office itself.

Lastly, there is the matter of compulsory licenses. The bill attempts to set forth under what conditions a patentee, who refuses to "work" his patent "adequately," shall be compelled to grant licenses to any one who demands them. The whole subject of compulsory licenses is one so novel in American patent law that we should like to consider it more carefully before deciding against it or in its favor. No doubt patents are willfully buried for their statutory lives of seventeen years, and no doubt the public would derive great benefits if they were "worked." But we can imagine conditions which would mean unfairness and hardship, if compulsory licenses were obtainable. On this point it will be interesting to read the testimony that is now being taken by the committee to whom the bill has been referred. Readers of the SCIENTIFIC AMERICAN undoubtedly have opinions on the subject. We should like to hear them.

The Rotary Mimeograph case is probably responsible for that section of the bill which dictates to the patentee how he may dispose of his invention. No longer is he to be permitted to stipulate what ink shall be employed with the printing press that he has invented. He is to control only the "specific thing" that he has patented. With that idea many will be in sympathy; but the section of the bill in which it is expressed is not happily worded. If, after proper amendment, it should become a law, the Supreme Court of the United States may be asked to decide whether it is not unconstitutional. Indeed, there is much in the bill which will require that body's interpretation, should it be enacted in its present form by some inconceivable chance.

The Senate Investigation

ALTHOUGH the alacrity with which the Senate commenced its investigation into the "Titanic" disaster is highly commendable, it is greatly to be regretted that the committee was composed of men without any technical knowledge of maritime matters. An investigation of this character should be carried on by men who are acquainted with the sea, and their cross-examination of witnesses should be of such a technically intelligent character as to quickly elicit those facts which will have a most important bearing upon the future construction and operation of passenger steamships on the high seas.

Our deplorable system of trying important cases of this kind in the public press and by the absolutely irresponsible daily reporter, has resulted, in the present case, in the injection into this matter, by certain disreputable papers, of a large amount of personal animus and abuse, with the result that more than one person prominently concerned in the disaster has been exposed to much unjust prejudice on the part of the public at large. The pity of it all is that the drift of the cross-examination in this Senate investigation seems to suggest that the prejudice exists in high quarters, from which for the sake of our reputation for national fairness and dignity, one could wish that it was altogether absent.

The Senate Commission should have called in to assist them one or two technical advisers of the highest standing; and they need not have gone beyond our Navy Department to find just the very kind of assistance of which the absolute puerility of some of the questions asked by the commission showed them to be so badly in need. The object of the inquiry should be to get at the technical facts and to avoid the unnecessary exploitation of the gruesome horrors of the disaster.

A Tribute to the Engineers of the "Titanic"

THERE is a world of heroic and tragic significance in the fact that the survivors' stories of the last hours of the "Titanic" make no reference whatever to the thirty-five officers of the engineer force. Of the officers of the deck there is frequent mention and many of them are among the survivors. This is natural and proper, for they were standing at their posts of duty. We read also of farewells between them and other officers whose duties were concerned with the welfare of the "Titanic's" passengers; but in all the records of those final eventful hours there is not a mention of any one of that band of men whose duties called for their presence far down in the deepest recesses of the ship.

In the roll of the saved there is not the name of a single certified engineer. Why this literal silence of the grave? There can be but one answer. Every man of the engineer watch stuck to his post to the very last and went down with the ship. Furthermore, this devotion to duty leads us to believe that such engineers as were not on watch may have voluntarily gone below to render what assistance they could in the sudden and frightful emergency.

This heroic devotion on the part of a little recognized body of professional men, the importance of whose duties on board ship is overlooked by the average trans-Atlantic passenger, will make an even greater impression upon our minds if we remember that they, above everybody else on that ship, must have known that she had received her death wound and that the hour of her sinking might be delayed, but not by any possibility averted. While those above deck, conscious of the enormous magnitude of the "Titanic," were exclaiming, "You cannot sink her," these men standing on the double bottom of the ship may possibly have seen the submerged edge of the iceberg come ripping through the sides of the ship, opening up boiler room after boiler room to the savage inrush of the water!

The bunkers, we learn, were arranged transversely to the ship. Hence if the bilges or side plating were ruptured, the inrush of water must have occurred before the very eyes of the engineers; and to the seafaring man there is no sight before which his courage will quail so quickly as this. Nevertheless, there is every reason to believe that not a man flinched from the trial. Steam was maintained in such boiler rooms as were not invaded by the water; the powerful bilge pumps were kept going to the very last minute; and the electric lighting plant was watched over, evidently with most careful solicitude. It is certain the pumps alone must have very materially delayed the sinking of the ship; and the value, in that hour of terrible stress, of the work done by the electrical engineers in keeping the lights going until the last trace of the ship had disappeared, it is impossible to overestimate.

Scientific Use of the Moving Picture

ONE of the most recent applications of moving picture films in scientific observation is made by L. Hartmann at Paris, and he finds that it is a great aid in the study of the deformation of metals when strongly compressed by the hydraulic press. In some cases he uses a brass tube of 3 inches diameter and 0.04 inches thickness of metal and observes the appearance of the surface when the tube is flattened out by pressure. Sometimes the tubes are filled with a liquid and then compressed. Various figures appear on the surface of the metal, and moving picture views are taken at the rate of fifteen per second. By throwing the views on a screen it is easier to study the effects than by direct observation.

Electricity

Electricity in Bread and Biscuit Making.—The electric motor drive lends itself especially well to the operation of the modern bakery. In the making of bread, cake and biscuit, cleanliness and uniformity of product are obtained by the electric motor, and there is the additional advantage of the ability to drive a single machine or group of machines at a time when the rest of the factory is shut down—for example, in the kneading of the dough, which must be done in the "small hours" of the morning. The induction motor gives a reliable power, as this machine will continue to operate even when every part is thoroughly coated with flour settling upon it from the air of the bakery. Among the interesting special machines employed are flour elevators and mixers, egg beaters, dough kneaders, loaf molders, biscuit and loaf conveyors, cake-icing machines. One plant in a western city, of a capacity of 85 barrels of flour per day, employs an average of 3,000 kilowatt-hours per month and operates electrically-heated ovens successfully in addition to electric motor-driven machinery.

Selectively Operated Telephone Train Dispatching System.—Experience with telephone train dispatching on certain railroads in the South indicates a saving by enabling the trains to proceed more rapidly, thus allowing the movement of a greater tonnage over the line in a given time than with telegraph dispatching. There are stated to be, at present, eighteen southern railroads using the telephone system, with about 7,800 miles of line and a total of 56 circuits equipped with 1,500 selector telephone stations. In each railroad installation the stations are operated from a common metallic circuit to which all the stations are connected, and the dispatcher rings the bell at any desired station (without ringing the other stations) by operating a selector apparatus. On some of the lines the selector operates to throw a semaphore out on the line, causing the conductor of the train approaching this position to stop and "answer the phone" installed in the semaphore post. Having received the dispatcher's orders, the conductor restores the semaphore to the "clear" position and proceeds with his train.

Remote Control of Rotary Converter.—A recent note in this column mentioned the advantage of the single-phase electric railway in doing away with the rotary converters that are required to transform alternating to direct current, and the attendance on them. A new automatic type of rotary converter, of 500 kilowatt capacity, to be installed by an electric light company in Detroit, will be controlled from a distance of one mile. This attendantless operation is secured by a special starting compensator at the distant point, in conjunction with automatic devices at the rotary. On throwing the handle of this compensator a reduced voltage is applied to the rotary, causing the latter to accelerate. When the proper speed is reached a centrifugal device closes the field switch, and as soon as this operation is reported back to the attendant (by the reduction of current through his ammeters as the rotary falls into step) the compensator can be thrown into the full running position. As soon as the rotary's voltage has risen to that of the bus system, the main direct current switch is automatically closed by a differential pressure relay adjusted to the value desired. A daily inspection of this machine is the only attendance required. The performance of this novel converter will be watched with interest by electric railway men.

Electrical Applications in Coast Defense.—In the reform of the United States coast defense after the Spanish war the generation and distribution of electric power at the harbor fortifications and its application for the transmission of intelligence, for motors, lighting, and the firing of explosives, have played an important part. Reliability, and security from hostile attack, not commercial economy of operation, are the ruling considerations in this work, necessitating isolated plants for emergency use, well protected from gunfire, and underground distribution systems. The gasoline engine requiring no smokestack (that would reveal the location of the generating plant) is most commonly employed, usually direct connected to a 25-kilowatt generator. Apparatus for the transmission of intelligence includes a "fire-control system" in which observations of changing atmospheric conditions are transmitted every few seconds to correct the ranges which have been worked out by triangulation, the telephone, and the telautograph—all these devices being operated by storage batteries installed in protected locations. Motor driven ammunition hoists, disappearing-gun retractors, and traversing and elevating mechanisms for pointing the guns have been highly developed. Search-lights—both direct and remote control types—are a necessary feature of modern harbor defense, and an effective heliograph system has been worked out employing shutters fitted to the faces of the projectors, allowing messages to be flashed long distances by day or night.

Science

Seismology in the Canaries.—The well-known geophysical and aerological observatory on the peak of Teneriffe is about to add seismological work to its present programme. The equipment has been furnished by Dr. Hecker of Straussburg.

Standard Time in Argentina.—Standard time was officially adopted in the Argentine Republic, beginning December 1st, 1911. The time is four hours later than that of Greenwich, and one hour in advance of that of Chile and Peru.

Making Cloth from Seaweed.—The Bureau of Manufactures in Washington has received samples of cloth made in England, by a process recently perfected, from the fiber of *Posidonia australis*, a species of seaweed found in the southern seas. Experiments made at Manchester University show that the fiber, after treatment, is soft, pliable, strong, much like wool in its disposition to curl and twist, and easy to spin in its raw state. It takes dye well, except green.

Moving India's Capital.—Arrangements are proceeding rapidly for the removal of the winter capital of India from Calcutta to Delhi, the announcement of which was the most striking event of the late Durbar. It is now expected that by next January accommodations for all departments of the government will be in readiness at Delhi, while the Finance and Comptroller-General's departments are expected to move next October.

Salaries of College Presidents and Instructors.—According to a recent publication of the Bureau of Education, the best paid head of any state-aided institution of higher education in the United States is the president of the University of California, who receives $12,000 a year and a house. The presidents of Illinois and Cornell universities each receives $10,000 a year and a house, while the president of the University of Minnesota gets $10,000 without a house. The lowest salary paid the head of one of these institutions is $2,400. The salaries of faculty members range from $50 a year for the least-paid tutor to $6,000 a year for the best-paid full professor.

Phosphorescent Bait.—It is stated that the fishermen of Cezimbo, Portugal, have a somewhat novel method of catching fish by the use of a natural phosphorescent substance. This is obtained from a fish known as *Malacocephalus lævis*, which, although rare in most parts of the globe, is frequently found in this locality. Upon pressing the abdomen of this fish there exudes a thick yellowish fluid which possesses a bluish phosphorescence in the dark according to M. Osorio, and he considers this to be due to the presence of a luminous microbe. The fishermen rub this substance upon a muscular tissue such as a piece of cuttlefish, and this is used as bait. The light appears to last for a long time, at least for several hours, and has a brighter glow when dipped in the sea. Fish are attracted to the bait by the light and are thus caught.

The Transcontinental Excursion.—Plans for the transcontinental excursion with which the American Geographical Society will celebrate its sixtieth anniversary, a preliminary notice of which has appeared in these columns, have now progressed to the point where it is safe to predict that this will be one of the noteworthy events in the history of American and international science. The party, under the direction of Prof. W. M. Davis, of Harvard University, will leave New York about August 15th, 1912, and return to that city about two months later. The principal European geographical societies and institutions will be represented by about thirty eminent geographers, including Messrs. Brückner, Machatschek, and Oberhummer, of Austria; Lecointe, of Belgium; Olufsen, of Denmark; Gallois, Grandidier, de Margerie and Martel, of France; von Drygalski, Partsch, and Penck, of Germany; Beckit, Chisholm, and Lyons, of England; Cholnoky and Teleki, of Hungary; Marinelli and Vinciguerra, of Italy; Niermeyer and Oestreich, of the Netherlands; Vogt, of Norway; Telles, of Portugal; Schokalsky, of Russia; Beltrán y Rózpide, of Spain; Gunnar Anderson, of Sweden; Chaix and Walser, of Switzerland. Ten or twelve American geographers will make the entire trip, while probably a hundred or more will accompany the party over parts of the route. A number of scientific institutions, including several scientific bureaus of the Government, have been asked to designate members of their staffs to accompany the party in relays, so that each institution will be constantly represented. The American members of the expedition will act as guides to the European visitors. The party will be entertained at several points *en route* by local scientific societies, and the expedition will close with a two-day meeting in New York, at which the foreign members of the party will make addresses on objects that have excited their interest, describing European parallels to the American examples. Provision will be made for the subsequent publication of the papers thus submitted.

Aeronautics

Second Flight Across the Irish Channel.—On April 22nd Corbett Wilson is reported to have flown across the Irish Channel in a heavy fog and rain. He started from Fishguard and landed at Enniscorthy, near Wexford. Robert Lorraine, the actor, was the first to make this flight in 1910.

The First Steel Airship in Germany.—A novel type of dirigible balloon is shortly to be constructed abroad by the Association for Motor Airship Traffic of Germany. This airship is being built after the plans of a Hanoverian engineer named Wuger. It is distinguished from all previous types not only by the material used, but also by significant peculiarities of construction which cause it to be regarded with special interest. It is built according to the rigid system and is expected to possess the advantages of that system and to play an important part in the German military air fleet.

A New American Passenger-carrying Record.—On April 20th George W. Beatty made two circuits of the Nassau Boulevard aerodrome in his Frontier-engined Wright biplane carrying five passengers. The total live load lift amounted to 845 pounds. One man sat in the passenger's seat and held another in his lap, while the three others lay prone across the lower plane. Beatty got off the ground in a couple of hundred feet and rose to a height of 150 feet during one round of the course. The above is the greatest dead weight carried by an aeroplane in the United States, besides being a record for passenger-carrying.

Delivery of a French Monoplane in England by the Air Route.—Maurice Prevost is the latest aviator to fly across the channel. On the 13th ult., desiring to deliver a Deperdussin monoplane which had been ordered by the British Admiralty, Prevost started from Issy at 6:45 A. M., carrying D. L. Santoni as passenger. Four and a quarter hours later he landed at Calais, where he stopped for a short time. He arrived at Eastchurch, Isle of Sheppey, at 1:30 P. M., 6¾ hours after starting from Paris. This is the record for a flight from the Continent to England with a passenger, although Prier, last year, and Salmet, this, accomplished the flight in the reverse direction alone in even quicker time.

Hydro-aeroplane Races in the Hudson River.—Preliminary to the Aviation Show from May 6th to 18th, a hydro-aeroplane demonstration will be given on and above the Hudson River on the afternoon of May 4th. There will be a mail-carrying contest from 138th Street to Governors Island and return, a passenger-carrying contest (with 155-pound passenger) around the Statue of Liberty, weight-lifting, quick getaway, accurate landing, and bomb-dropping contests. A preliminary 5-mile handicap race from 138th Street to 86th Street and back will be flown in order to determine the handicap for the 36 mile race from 138th Street to Seagate and return. No less than a dozen machines have been entered in these events.

An American Aviatress First to Fly Across the Channel.—Fifteen days after Miss Davies made the pioneer flight for a woman across the English Channel, Miss Harriet Quimby crossed alone in a Blériot monoplane. Her time in the air on this flight was about one hour. She passed over Dover in leaving England and over Boulogne on entering France. She landed at Hardelot, near Boulogne, where Blériot has an establishment. Thus to an American aviatress belongs the honor of making the pioneer flight of her sex across the much dreaded channel. Neither she nor Miss Davies experienced the least *mal de l'air*, although they have both, no doubt, had *mal de mer* in crossing the self-same channel. Both agree that the air route is the pleasantest, as well as the quickest, way of traveling from the British Isles to France or *vice versa*.

Record Flight With a Passenger from London to Paris.—On April 2nd, Gustav Hamel left the Hendon aerodrome near London on a 70-horse-power Gnome-engined Blériot monoplane with Miss Trehawke Davies as passenger. He headed direct for the channel, which he crossed successfully, and afterward alighted for a few minutes in order to refill his fuel tanks. The start was made at 9:38 A. M., the wind becoming more violent every minute. As a consequence he rose 6,500 feet and passed over Dover at 10:30. He descended to 1,800 feet in crossing the channel and did not notice the wind nearly as much above the water. He passed over Boulogne, and at about 11:05 landed at Ambleteuse. After a short rest he flew to Hardelot, where he stopped again for luncheon. It was at Hardelot that he took delivery of his monoplane some months ago, when he flew it along to Hendon. At 3:45 he started again for Paris in a much stronger wind than he had encountered previously, landing in two hours at Issy-les-Moulineaux. The flight occupied 3½ hours estimated to be at an average speed of about 65 miles an hour.

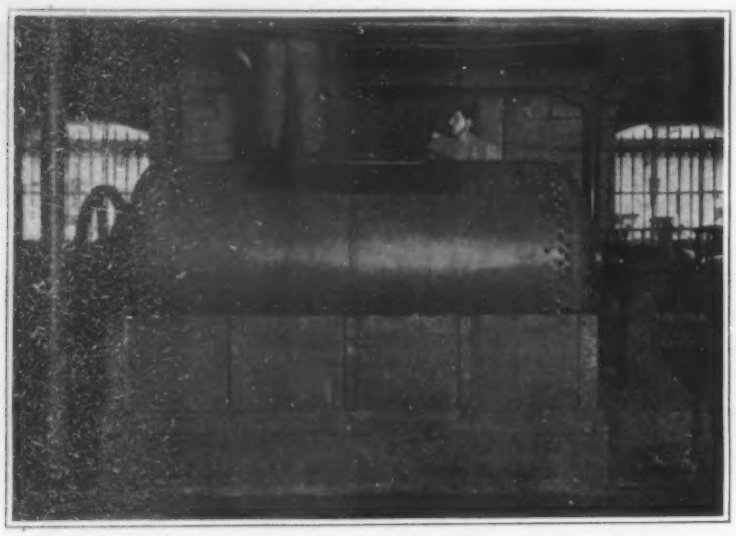


Fig. 1.—The old apparatus for the chemical destruction of banknotes.

Fig. 2.—Top of the new apparatus used by the Bank of France for incinerating banknotes.

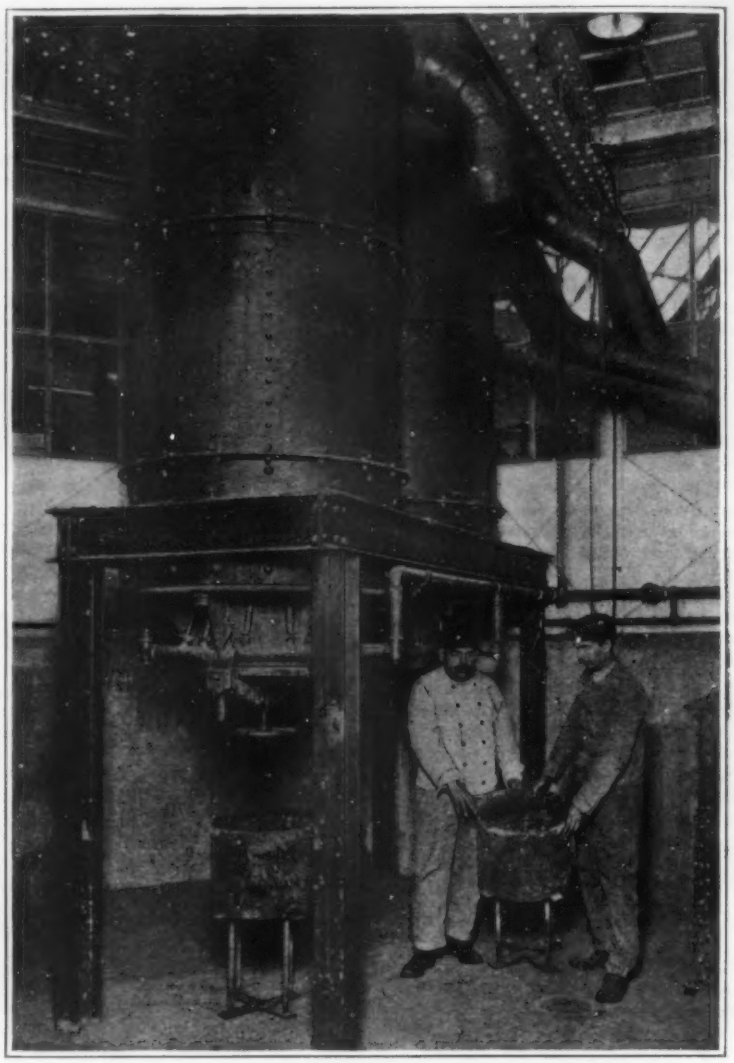


Fig. 3.—Lower part of the new incinerating apparatus.

Destroying 300 Millions in Paper Money

A Scientific Method of Burning Banknotes

By Jacques Boyer

THE bank of France is rather fastidious in regard to the condition of its notes and never fails to destroy those that return to it mutilated or greatly soiled. The destruction of the notes might appear to be a very simple operation but certain practical difficulties are introduced by their enormous number. In the year 1910 the bank destroyed more than one million 1,000 franc notes, nearly two hundred thousand 100 franc notes and nearly eight million 50 franc notes, which in the aggregate weighed thousands of tons and represented a value of 1,600 million francs or more than 300 million dollars, without counting the 612 notes of five, twenty and twenty-five francs that were withdrawn from circulation.

It is essential that none of this great stream of money shall find its way into the pockets of dishonest employees and that no clever rogue shall find opportunity to reconstruct notes from their fragments. The notes must therefore be completely destroyed, and the law requires the destruction to be witnessed by a regent of the bank.

At first the notes were burned in the open air. They were placed in a cylinder of iron rods over a wood fire. The cylinder was mounted on trunnions and was turned, by means of a crank, at intervals during the incineration, which occupied three hours. This primitive method sufficed until 1873, when it was decided to retire the numerous fractional notes of five, twenty and twenty-five francs that had been issued during the Franco-Prussian war. The magnitude of this task compelled the technical staff of the bank to seek a better method of destruction and, on the advice of Berthelot, a chemical process was adopted. After the notes had been separated by women, under strict surveillance, they were introduced into the rotary boiler shown in Fig. 1 and were macerated in soda lye for three days. Each boiler was charged with 900 to 1,100 pounds of banknotes and 130 pounds of caustic soda, to which about 1,000 gallons of water were added in successive portions.

This process left a bulky and troublesome residue, similar to paper pulp, and it also entailed much work and an elaborate system of supervision and surveillance. Hence the technical staff of the bank, with the assistance of the eminent chemist Haller and the engineer Lequeux, an expert in heating by gas, devised a furnace of special type for the incineration of banknotes. The new apparatus, which was installed a few months ago, is illustrated in Figs. 2 and 3. The incineration is effected in two stages. In the first stage, which is an ordinary distillation in closed vessels, the banknotes are converted into coke, while in the second part of the operation this coke is burned and reduced to ashes. This method is free from the defects of the various chemical and physical processes which are usually employed for the destruction of banknotes and similar papers. In some of these processes, like that of Berthelot described above, chemical reagents are used, while others employ combustion or mechanical disintegration by means of a rotary grinder or cutter. All of these methods, however, present great difficulties of execution when they are applied to papers tied in bundles, for neither the chemical reagents nor the flame penetrate deeply into the interior of the bundles, and in order to destroy the papers completely they must be subjected to a laborious and tedious operation of separation which requires strict and minute surveillance because of the value of the papers. The rotary cutter is equally inefficient when applied to papers tied in bundles, which rapidly dull the blades and often clog the cylinders.

In the new process the paper is converted into coke in an iron retort, from which the gases escape through a perforated false bottom. The retort is provided with manholes at the top and bottom, and the greater part of it is inclosed in a jacket lined with fireclay. The top of the retort communicates with a conduit which leads to a chimney and is provided with a valve, and a similar conduit connects the chimney with the annular space between the retort and its jacket.

The operation of the apparatus is illustrated by the accompanying photographs.

Fig. 2 shows a workman unlocking the cover of the upper manhole for the introduction of the corded and sealed bundles of banknotes which his associates are bringing in large baskets. The manhole is then closed and the retort is heated by a ring of gas jets placed in the lower part of the annular space surrounding the retort.

Under the influence of heat the paper becomes gradually transformed. The tar and other first products of distillation flow through the perforated false bottom and through lateral orifices beneath it to the annular space, where they are ignited by the gas burners and thus assist in elevating the temperature. The gaseous products then escape through the pipe which connects the annular space with the chimney. When the paper has been completely converted into coke the valve in this pipe is closed and the valve in the conduit connecting the top of the retort with the chimney is opened. The draught of air thus introduced into the retort reduces the incandescent coke to ashes, which are subsequently removed through the lower manhole by means of a special tool and placed in the iron buckets shown in Fig. 3. The bucket which the men are holding contains the residue of 150,000 one hundred franc notes, representing a face value of nearly three million dollars, which were destroyed by the consumption of less than three dollars' worth of gas.

Each retort is charged with 330 pounds of banknotes which are completely destroyed in twenty hours, eight of which are employed in heating and carbonizing the paper and twelve in burning the coke. The operation is usually performed weekly in the presence of the regents and chief officials of the Bank of France. The two retorts shown in the photographs have proven so satisfactory during their few months' service that others will soon be installed.

A somewhat similar apparatus is in use in Washington for the same purpose.

Electric Heating in Norway and Sweden

SEVERAL towns in Norway and Sweden have recently taken steps toward the general introduction of electric heating, to replace the use of stoves burning coal or wood. Few buildings in these places have central heating systems, and the tile stoves now generally used could easily be adapted to receive electrical heaters. The electric current will be supplied by the public plants, which are generally run by water power.

A Flying Machine That Folds Its Wings

Ingenious Method of Reducing the Spread of an Aeroplane

THE novel monoplane shown on our frontispiece was one of those which attracted a great deal of attention at the last Paris Salon. It is known as the Marçay-Moonen monoplane, and is the result of the inventive genius of M. de Marçay. Credit for the final testing and putting in workable order of this new monoplane should be given to M. Henry Chazal, while most of the flights have been made by Aviator Herremans.

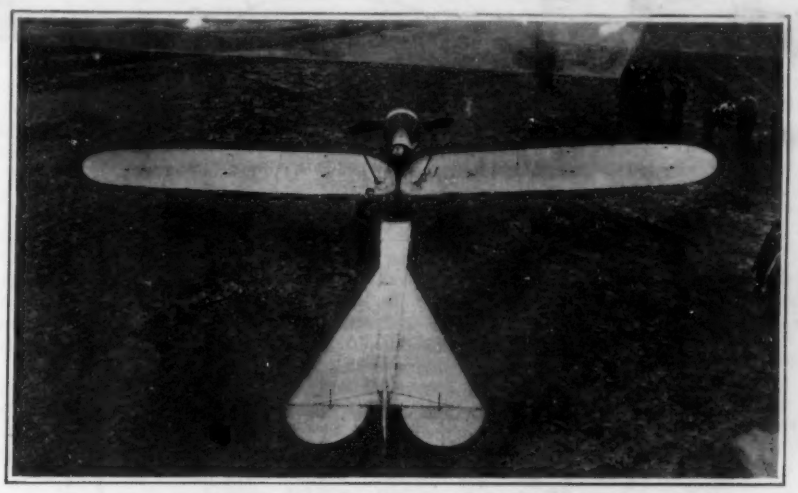
The idea of the inventor of this monoplane was to produce a machine the wings of which could be turned back out of the way when not in use, and he has succeeded in carrying out this idea in excellent fashion. Our frontispiece shows the machine viewed from above when in the latter condition, while the other photograph on this page shows the wings spread ready for flight. When in this position, they have a spread of 44 feet, while when turned back, the machine can pass through a space one-quarter of this width or less. The over-all length of the monoplane is 39 feet.

The wings are supported on inclined spars (one for each wing) attached to the triangular body, and are guyed to the top and bottom ends of these spars. The inclined spars are rotated by means of sprockets and chain, worked by a hand wheel, sufficiently to swing the wings from one position to the other. The longitudinal stability of the monoplane can be maintained in some degree by moving the wings forward or backward slightly, and when the machine alights, the wings can be turned back by the aviator, who can then run his machine into the hangar or travel along the highway if he so desires, drawn by the powerful tractor screw.

The Marçay-Moonen monoplane is the progenitor of the auto-aeroplane, i. e., a machine that can be used both as an automobile for traveling on *terra firma*, or as a flying machine when air navigation is to be preferred. The combination of turnable wings with the small wings now being fitted to some of the high-powered monoplanes would make a machine that would not take up more space on the road than does the usual large closed automobile of the present day.

Maurice Tabuteau flying at full speed in his 50 H. P. Morane-Saulnier monoplane.

Insert: Profile M. Tabuteau. This aviator flew from Pau to Paris—410 miles—in 4¾ hours, including a non-stop flight of 230 miles from Pau to Poitiers at 98½ miles an hour.



Rear view of Marcay-Moonen monoplane with wings extended for flight.

A FAST MONOPLANE AND A MONOPLANE WITH FOLDABLE WINGS

Eliminating Mental Fatigue

MANY processes have been designed for strengthening the body and making it more resistant against fatigue, but none to increase the working capacities of the mind, apart from a methodical training and the use of stimulants, which do more harm than good.

Recent investigations by Dr. W. Weichardt, professor at Erlangen University, have at last elucidated the nature of fatigue (physical or mental). The muscles of small animals (mice, guinea-pigs, etc.), subjected to excessive exertion, were, in fact, found to contain a poisonous (toxic) albuminous product called kenotoxine, which could be as well obtained by artificial means. This product then forms spontaneously an antidote (called anti-kenotoxine) which counteracts its prejudicial effects. When injected below the skin of animals, kenotoxine will produce a drop of temperature, slackening of respiration and a pronounced drowsiness. If, however, the same subjects be previously treated with anti-kenotoxine, they will remain absolutely fresh, their respiration undergoing no slackening. Recent experiments have even shown such anti-kenotoxine injections to increase, in man, not only the physical vigor, but even mental efficiency. As pointed out in an address delivered before the eleventh annual meeting of the German Association for the Promotion of School Hygiene, a German schoolmaster, Mr. F. Lorentz, has, in fact, applied this method to his own pupils, with a view of ascertaining whether an accurate biological measure of fatigue could be thus obtained, and also whether preparations containing the antidote (anti-kenotoxine) would allow the mental capacities of the pupils to be increased.

After confirming on himself Dr. Weichardt's results, he undertook some methodical experiments, the pupils being given a set of arithmetical tasks, on a certain plan, so as to exclude any self-suggestion. He mainly considers quantitative results, viz., the time taken in obtaining a given number of resulting figures, both with perfect mental freshness and in a state of fatigue.

In order to appreciate the *quality* of results, both the number of errors and the frequency of corrections are taken into account. As there are practically no errors due to ignorance, those made by pupils should be put down to exhaustion of the psycho-physical mechanism, as manifested by reduced attention and weakened memory. Corrections are mainly to be considered as symptoms of physiological fatigue, bodily lassitude, reduction of the field of vision and diminution of the visual power.

Each pupil, having received a sheet containing the tasks to be solved, has to do his sums at the teacher's command. After finishing the work, he rises from his seat. Exercises are made both before the first and after the fourth lesson. In order to allow the spontaneous diminution of mental power to be gaged, Mr. Lorentz makes some comparative tasks with and without anti-kenotoxine, respectively.

Whereas the initial exercises are completed by 3 pupils in 5 minutes, by 33 pupils in 8 minutes and by 16 pupils in 10 minutes, those made after the fourth lesson (without any application of an antidote) are completed by 1 pupil in 5 minutes, by 27 pupils in 8 minutes and by 23 pupils in 10 minutes. The reduction in the rate at which the sums are done obviously should be ascribed to the mental fatigue inseparable from half a day's school work. If, now, some anti-kenotoxine be vaporized in the class-room, before the beginning of the second set of exercises, 3 pupils are found to do the tasks in 3 minutes and 31 in 4 minutes, while only 1 takes 10 minutes as before. This striking improvement in the mental efficiency of practically all the pupils is only accounted for by the absorption of minimal quantities of anti-kenotoxine, the antidote against fatigue, in the organs of respiration. The *quality* of results likewise undergoes a marked improvement, both the number of errors and corrections being reduced.

Inhalation of anti-kenotoxine thus gives rise to a considerable improvement of mental efficiency.

The Use of Air Craft in Exploration

NOWADAYS, when we read of the perils and hardships encountered by the explorer, whether in polar wastes, African deserts, or South American jungles, to say nothing of the enormous expenditure of time and money entailed in his undertakings, the question must occur to us: Will not aerial navigation before long vastly simplify the process of exploration? And, if so, would it not be well to defer activities in this direction for a few years, until the time is ripe for aeronauts to take up such work?

It must be admitted that aeronautical exploration has hardly yet reached the practical stage. Many enterprises of this character have been planned, but apparently none have come to fruition. Everyone recalls the dismal failure of Wellman's attempt to reach the North Pole in an airship, as well as the earlier and more disastrous undertaking of Andree. A year or two ago there was talk of a series of balloon voyages across the unknown interior of New Guinea, but the scheme appears to have proved abortive. The exploration of the Sahara by means of aeroplanes is a piece of work that has for some time seemed cut out for the French military aviators, but we are not aware that any part of this great task has yet been achieved, beyond some preliminary experimenting.

The most talked-of scheme of aeronautical exploration is the proposed Arctic voyage of Count Zeppelin. The plans for this enterprise are being matured with wise deliberation. Not long since the Count and some of his colleagues visited Spitzbergen and made a careful investigation of the conditions likely to be encountered in such a voyage. We are glad to see, in a recent number of *Petermanns Mitteilungen*, a very sanguine article by Dr. Hergesell, Zeppelin's scientific adviser, with regard to airship exploration in general, and the projected Arctic expedition in particular. Hergesell points out the great improvements that have been made in the Zeppelin airships during the past year or two. Thus, during 1911 the "Schwaben" made over one hundred trips without an accident. This ship travels at the rate of 45 miles an hour, a speed that seems to eliminate the danger from ordinary storms and strong head winds. It has three motors of a new type, and the propelling machinery has never yet failed to perform its work satisfactorily.

The gist of Hergesell's argument is that the airship, like every other invention, will require a certain amount of time for its perfection, but that if progress continues at the present rate the stage will soon be reached when explorers may safely avail themselves of this mode of travel.

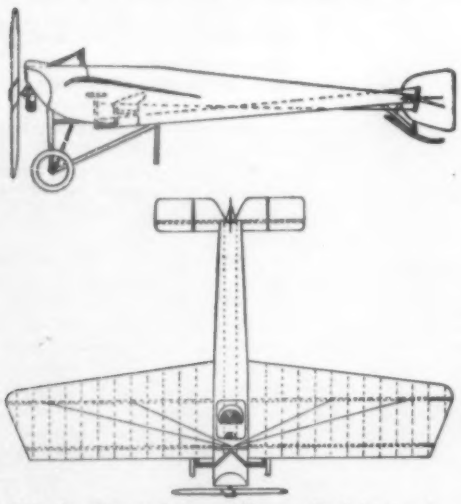
To this conclusion we may add the fact that air navigation is the *only* method, so far as can now be foreseen, by which certain regions will ever be thoroughly explored and surveyed—e. g., the Arabian and Libyan deserts—and bids fair to be much the simplest and cheapest means of completing our knowledge of many others. In SCIENTIFIC AMERICAN SUPPLEMENT No. 1892 we published the results of some interesting research work on attachments for cabureters of gasoline motors for cleaning the air, which is filled with dust and sand particles above the desert.

Design of Racing Aeroplanes

Drawings of Some Remarkably Fast Monoplanes, With Designs for an International Cup Defender

By Stanley Yale Beach

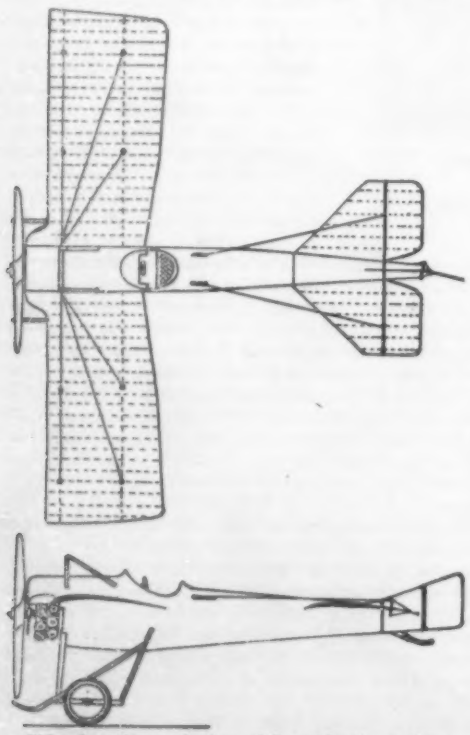
THE tremendous speeds attained by several French monoplanes recently, both on a circular course and across country, augur well for some rare sport at the time of the international cup race, which is to be held near Chicago on September 9th. A little over a year ago M. Edouard Nieuport set up a complete new list of speed records with his new monoplane fitted with a 30 horse-power double-opposed cylinder motor, and later with a 50 horse-power Gnome; and in the international race in England last July one of his machines, piloted by Charles T. Weymann, won the cup for America with a speed, sustained for 93 miles, of 78.1 miles an hour. On



Side elevation and plan of Morane-Saulnier monoplane with 50 horse-power Gnome motor.

March 1st last, at Pau, France, this speed record was increased nearly one-third by Vedrines on a 140 horse-power Deperdussin monoplane. Tabuteau, with but a 50 horse-power Morane-Saulnier monoplane, has also made some fine speed records, such as 145.66 miles in two hours above a circular course, and 230 miles across country without a stop in 2⅓ hours (98.57 miles an hour). As both these machines are of interest on account of their speed performances, we present scale drawings of them to our readers, together with a few details.

The Deperdussin monoplane is the design of M. Bechereau, chief engineer of this establishment. It has been on the market over a year, and the regular machine was fully described in SUPPLEMENT No. 1874. The latest racer has been made exceedingly compact. It has a spread of but 23 feet with an over-all length of 20½. Each wing is only 10½ feet long by 4¼ feet wide at its



Side elevation and plan of Deperdussin racing monoplane with 140 horse-power Gnome motor.

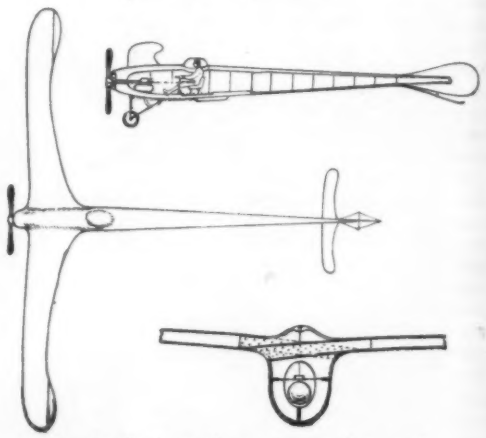
inner end (next to the body) and 5⅓ at its outer. There are 100 square feet of supporting surface in the main plane and 15 in the tail, plus 10 more in the elevator, which is 1⅔ by 7¾ feet in size. The vertical rudder has 4 square feet of surface, being 1⅔ feet wide by 2⅓ high. It terminates a small stabilizing fin at the end of the fuselage, as can be seen in the drawing. The small skid below the tail is provided with an elastic attachment within the body. The tail is a flat, tapered, non-lifting one, and the wings as well are nearly flat, having a very slight camber and being set at a flying angle of but 5 degrees. The shape of the wings is the reverse of what is generally the case, narrow at the inner ends and wide at the outer. By shaping the wings in this way it is possible to get a much stronger balancing effect from the warping, which is necessary with a machine of so little spread. The rear edge of the wings is quite flexible, which tends to give a certain degree of automatic transverse stability. The wing spars are of hickory, and the ribs, of I cross-section, are of pine and ash. The same construction is used in the tail. The front edge of both wings and tail is of three-ply veneer. Stranded steel cables are used for the wing guys both above and below. In accordance with the discovery of M. Blériot that the upper guys are likely to receive nearly, if not quite, as great a strain as the lower ones when a sudden *vol plané* is made, the upper guys are now made much stronger than heretofore. No braces or guys are employed on the tail. The under carriage or landing chassis of this machine is the same as has been used from the start. Vertical and slightly inclined uprights on each side connect the body with a short stick running fore and aft across the axle of the wheels and suspended from it by heavy elastics, while an inclined skid on each side projects in front enough to protect the propeller. The latter, 8¼ feet in diameter, is carried on the revolving part of a 14-cylinder Gnome motor. The main bracket for supporting the motor is at the rear, but there are also three steel tubes arranged in a Y in front.

The fuselage, or body, of Vedrines' racer is the usual lattice girder, rectangular in cross section though of more generous dimensions, employed on the regular stock machine. In view of the remarkable speed developed by the Paulhan-Tatin torpedo (94 miles per hour with 50 horse-power), this new racer has been given a torpedo-shaped body by covering the fuselage proper with a three-ply wood shell. This is of course cut away on top where the pilot's seat is placed. The control wheel, as usual, is mounted upon an inverted U-shaped frame pivoted at the bottom. Rocking this frame by pushing or pulling on the wheel operates the elevator and directs the machine upward or downward, while turning the wheel warps the wings. Steering is accomplished with the usual foot tiller. Oil is kept from striking the pilot's face by a thin shield of aluminium that covers the top half of the motor.

Besides covering 103.59 miles in one hour over a 10-kilometer circular course and afterward making one round of the same 6.21-mile circuit at the rate of 104⅓ miles per hour, Vedrines has toured all over France in his racer in an endeavor to get himself elected to the Chamber of Deputies. Despite a rapid "flying" campaign, with speeches in many towns and villages, the energetic little Frenchman was defeated. At the end of all these flights the monoplane frequently touched earth when traveling 90 miles an hour, yet the chassis has never been badly damaged or the machine seriously broken.

Vedrines also was the first pilot to test the new Morane-Saulnier monoplane last January. Without any preliminary tuning up, he took this machine (which was fitted with a 50 horse-power Gnome motor) out and flew it for 20 minutes, rising to 1,000 feet and developing a speed of 78 miles per hour. Since then Tabuteau has broken all the speed records on a circular course, and also across country, for a monoplane of but 50 horse-power.

This new machine has a fuselage somewhat similar to the Nieuport. It is rather blunt in front and tapers toward the rear. Like the Deperdussin, the body length is but 20 feet, though the spread is 30. The wings are 6½ feet wide at the body, tapering to 5 feet at the ends. The ends are beveled off also, the front edge of each wing being nearly 2 feet shorter than the rear edge. The object of this is to reduce the strain at the tip of the wing and yet to retain a good warpable surface. There are 145 square feet of supporting surface in the wings, 8 in the central stationary tail, and 12 in the movable tips of same that form the horizontal rudder. The dimensions of the tail complete are 10 feet across by 2¼ fore and aft. The vertical rudder is 2½ feet wide by 3 feet high, and contains 5¾ square feet of surface. The chassis was without shock absorbers as originally produced, but this has been modified in the manner described herewith. Instead of the wheels being mounted on a solid axle and inclined outward slightly (as on Santos Dumont's old "Demoiselle"), they are now on a springy wood axle above the axle proper (which is of oval steel tubing) and secured to it at the center. Heavy elastics hold down the ends of the auxiliary axle and allow these to play in a slot cut in the vertical strut. The forward guys of the wings, united by pieces of chain as they descend diagonally from each side, are attached to the axle at its center at the apex of a triangle formed by inclined braces extending upward to the lower front end of the fuselage. From this same point on the body other braces extend downward and outward to the axle near its ends, while still another inclined pair run upward to the body 2½ or

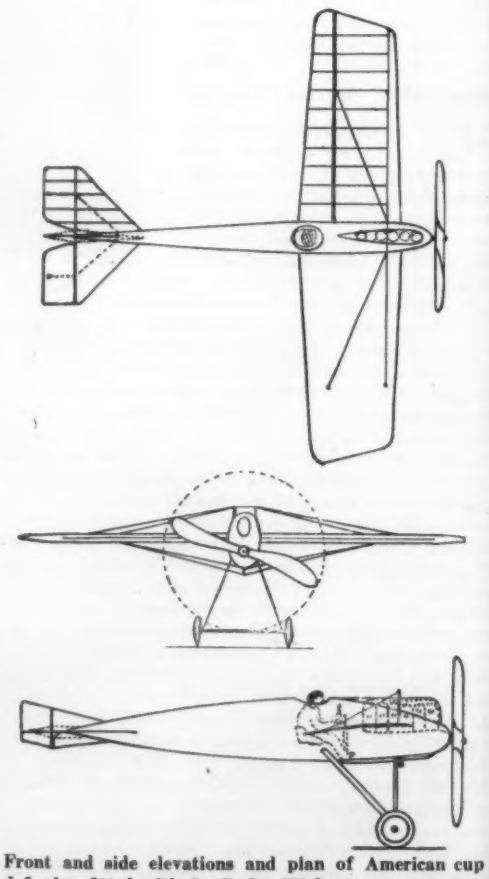


Longitudinal section, cross-section and plan of *Scientific American* all-steel racer.

The cross-section is taken at the point where the single steel wing spars join together and attach to the web of the body.

3 feet from its front end. Thus it will be seen that although little or no shock absorbers save the pneumatic tires are provided, the chassis is very substantially braced. A single V strut projecting below the body about half the distance of the axle below it, carries the rear guys including those which warp the wings and which are in duplicate. In fact, double guys of stranded steel cable are fitted throughout. The controls are similar to those on a Blériot, consisting of a pillar mounted on a universal joint for elevator and warping, and a foot tiller for steering.

(Concluded on page 409.)



Front and side elevations and plan of American cup defender, fitted with 6-cylinder 120 horse-power motor.

Correspondence

[The editors are not responsible for statements made in the correspondence column. Anonymous communications cannot be considered, but the names of correspondents will be withheld when so desired.]

Searchlights on Ocean Liners

To the Editor of the SCIENTIFIC AMERICAN:

As the appalling loss of life due to the foundering of the "Titanic" is of universal interest to those who are frequent travelers by sea, and as one who has traveled extensively, I wish to voice through the medium of your valuable publication what to my mind would be one method of preventing many serious accidents of like nature; namely, the enforced installment and use of a powerful searchlight, to be used as a headlight, on all ocean-going liners. Why steamers should not light their path has always been a mystery to me; but custom, that peculiar bugbear, is often responsible for the want of progress in many things. What would we think of a trolley car or automobile running without a headlight? Why do locomotives use a strong headlight? Not for ornament, surely. Now, had the "Titanic" been equipped with a searchlight, the lookout and officers on the bridge would have detected the floe or berg in ample time to have prevented the accident, as it is generally admitted the night was clear though dark. The general use of this device, which a vessel has at first hand, would insure safety against the waterlogged derelict, which is just as likely to damage vessels as a berg. As you know, the Suez canal authorities demand the use of the searchlight in navigating their canal; so why not use them at all times when running at night. H. D. WALLACE.

New Orleans, La.

Optical Phenomenon Seen from the Battleship "Virginia"

To the Editor of the SCIENTIFIC AMERICAN:

Having read in a recent number of the SCIENTIFIC AMERICAN about a curious phenomenon sometimes seen in the Straits of Messina known as the "Fata Morgana," I thought I would take the liberty of mentioning a very similar phenomenon which I witnessed about a month ago in the waters of the lower Chesapeake Bay.

We were having battle maneuvers preparatory to firing, and although there was a steady breeze blowing, the air was extremely hazy, so the horizon could not be seen. This haze, however, was not of the dry kind seen at mid-summer; it was shortly after a heavy fog, and the air was rather damp. The air seemed all aqiver, like heat waves.

Our ship, the "Virginia," was underway, a considerable distance from where the fleet lay anchored. We were about six or seven miles distant from the rest of the fleet when it was my turn to go on lookout at the masthead.

Immediately upon arriving at my post I noticed a most peculiar appearance of the fleet; the hulls seemed strangely swollen and distorted, while the masts looked absurdly short and out of place. I should say that the hulls of the ships looked at least three times larger than their natural proportions, while the masts seemed to retain their natural proportions.

This condition of the atmosphere seemed to last until a couple of hours before sundown, about 4 o'clock, I should say. The phenomenon itself, however, disappeared as soon as we got within a couple of miles of the fleet, or out of focus, as it were. As we anchored for the rest of the day, I had no further opportunity of observing the phenomenon. C. J. PODEWILS, O. S.

Boston, Mass.

The Sinking of the "Titanic"

To the Editor of the SCIENTIFIC AMERICAN:

It will be difficult from the testimony of the survivors to determine the specific cause which led to the sinking of the "Titanic," and in what particular respect her structure failed. It is, however, possible to review some of the engineering features of the case from all the knowledge at hand.

From apparently authentic sources it is stated that the ship struck an iceberg and sank in a very short time. It seems therefore fair to assume that she was going at a high rate of speed, if not at full speed.

It seems fair to assume that if the "Titanic" had lost one hundred feet of her bow and received no other damage, she could have proceeded on her way without assistance; and it is quite probable that if she were cut in two in the middle, both halves would float for an indefinite period. It seems also fair to assume that the bulkheads were constructed of the proper strength to withstand the water pressure due to the flooding of any compartment.

Considering these facts, the destruction of the ship could not have been brought about by the immediate damage to the bow, and it is hardly possible that the longitudinal girders had sufficient strength as columns to have been driven back through the ship, shearing away from the transverse bulkheads for any great distance.

The purpose of this article, after having discussed the primary forces and effects, is to discuss the secondary forces within the ship itself, and to see if it were not these which led to the destruction of the ship.

Let us first consider the boilers and engines. These were undoubtedly very securely fastened, but their weight amounts to several hundred tons, and their momentum if the ship was suddenly stopped must be sufficient to tear them from their fastenings, break all the steam pipes, and hurl them with great force against, and probably destroying, all of the adjoining bulkheads; this alone would scald everyone in the hold instantly and fill the ship with suffocating steam and gases.

Second: There were several thousand tons of freight and coal stored against the bulkheads whose momentum must have been like an avalanche, sweeping away the bulkheads as though they were paper, so that the water which entered through the destroyed bow could reach every part of the ship without hindrance. ERNEST C. MOORE.

New York City.

The Peril of the Wireless Meddler

To the Editor of the SCIENTIFIC AMERICAN:

In the April 13th issue of the SCIENTIFIC AMERICAN, a correspondent—Edwin L. Powell—makes an untimely and futile defense of the amateur who interferes with the transmission of official wireless messages. Untimely; in view of the fact that for forty-eight hours the Siasconset station on Nantucket Island was prevented from receiving wireless messages from the "Carpathia" when she was hurrying to New York with the survivors of the terrible "Titanic" disaster. Futile when one considers the efficiency of the Governments apparatus located at every important point along the Atlantic seaboard.

It is a deplorable condition when news of vital import such as this, involving the lives of two thousand passengers in mid-ocean, is confused, and the lives of those passengers jeopardized by irresponsible meddlers. This class of wireless experimenters, while they may not willfully interfere with official dispatches, nevertheless *do* interfere, which fact is attested to by the Navy Department records and by the French Government in 1908, when "leakage" of important official messages from the Eiffel Tower to the commander of French forces at Casablanca was discovered.

A French scientist pointed out the ease with which these dispatches were intercepted by an ordinary wireless apparatus of his own construction, and it was later proved that these messages were received at the French military wireless station of Verdun, and probably at a neighboring German station across the Vosges. This naturally created widespread consternation in French military circles, and steps were taken to perfect a system proof against leakage, but no system can as yet be devised to remedy this grave defect. The few instances where amateurs have assisted authorized Government operators are outweighed by the annoyance occasioned by their meddling with dispatches of vital importance.

It is the amateurs who dabble in wireless and retard the progress of this branch of electrical science, and it is high time that the Government called a halt to the ever-increasing danger of amateur experimenters, and a hopeful note is sounded in the assembling on April 16th of the Cabinet by President Taft to discuss a regulation of interference from such a source. The insinuation of the above writer that the Government is to blame for "their inability to cope with interference on account of employing instruments that are antiquated and unfit for their present needs," is false and groundless.

The equipment of the Government wireless stations is of the most advanced and delicate type, but even then it would be subject to the interfering ether pulsations emanating from amateur apparatus. A rule that would be effective must not single out exceptions among the amateurs here and there, but must include them all, and this elimination of undesirable meddling certainly would not "place a strong hindrance on the advancement of the art," but on the contrary, would prove of incalculable benefit to wireless telegraphy.

I trust that this point of view, considering the wireless meddler as a peril to the lives of passengers on sinking ocean liners, is worthy of meriting a place in your valuable journal. It is certainly more practical than the idea that the amateur meddlers render a great service to the authorized stations, which is very difficult to see in the light of recent developments in eastern New England. DONALD P. BEARD.

Independence, Mo.

Starting and Alighting in an Aeroplane

To the Editor of the SCIENTIFIC AMERICAN:

Owing to repeated inquiries by the public as to the proper way of starting and alighting in an aeroplane with relation to the direction of the wind, I give an explanation through the columns of your paper.

In an aeroplane, two velocities are considered, the one which is relative to the ground and the other which is relative to the air. By velocity of the aeroplane relative to the ground is meant the distance the machine traverses in the air per unit of time, while its velocity relative to the air is the number of square feet of air the plane passes over per unit of time.

When an aeroplane travels against the wind, its velocity relative to the ground decreases to the extent of the velocity of the wind, and its velocity relative to the air at certain times increases temporarily to the extent of the wind's velocity. For example: If the normal velocity of the aeroplane is 40 miles an hour, and it runs against a 10-mile wind, its velocity relative to the ground would be $(40-10)$, or 30 miles, while its velocity relative to the air would be $(40+10)$, or 50 miles. The latter means that the plane would have, at the particular time, just as much lift as if the machine were running at the rate of 50 miles an hour in still wind.

It is the opposite when the machine runs with the wind. In this case, the velocity of the aeroplane relative to the ground increases to the extent of the velocity of the wind, and its velocity relative to the air at certain times decreases momentarily to the extent of the velocity of the wind. For example: If the normal velocity of the aeroplane is 40 miles an hour, and it runs in the direction of a 10-mile wind, its velocity relative to the ground would be $(40+10)$, or 50 miles, and its velocity relative to the air would be $(40-10)$, or 30 miles. This means that the machine would have as much lift in the particular case as if it were traveling at the rate of 30 miles an hour in still air.

The above statement is true at the time of the change of the lateral direction of flight with relation to the direction of the wind, and also, at times of sudden changes in the velocity of the wind, which reasons give us the idea of having almost the same principle applied to the change of the longitudinal direction, the effect of which causes the difference in starting and alighting against, or with, the wind. Otherwise, the velocity of the machine relative to the air remains always the same, irrespective to the increased or decreased velocity relative to the ground, caused by the effect of the wind's velocity.

Therefore, in starting against the wind, the increased velocity relative to the air gives the aeroplane a greater lift, causing it to leave the ground within a shorter distance, and to rise in the air quicker than it would in starting with the wind, in which case the lift of the plane decreases with its decreased velocity relative to the air. For such reasons as herein mentioned, it can readily be seen that in some cases it is impossible for the machine to leave the ground in starting with the wind.

In alighting against the wind, the wind acts as a brake on the plane through the increased upward pressure, and a safe landing is certain to be had if properly made; but in alighting with the wind, the machine comes down with accelerated speed due to the decreased upward pressure, making landing very difficult even to the most skilful aviator, and in some cases the control of the machine may be lost, causing a disaster. Also, under certain conditions, whether in starting or alighting with the wind, the tail is liable to get caught by the wind turning the machine somersault.

Starting or alighting sidewise to the wind is dangerous, because when the wind strikes the machine on either side of the plane, it may tilt while too near the ground, and there may not be a chance of righting it up before it touches the ground, which results in a wreck.

From the foregoing, it follows that starting or alighting in an aeroplane, is preferably made against the wind.

New York city. S. S. JERWAN, Aviator.

Gyroscopic Action in Aeroplanes

To the Editor of the SCIENTIFIC AMERICAN:

S. S. Jerwan, Joseph A. Blondin, and others are debating on the natural "Gyroscopic Action in Aeroplanes." I am in the audience, so it would be very improper for me to speak to one of the debaters, but, of course, this is proper: I whisper to my neighbor, the Editor of the SCIENTIFIC AMERICAN, that those gentlemen do not seem to be talking about the same kind of a machine.

From Mr. Jerwan's article I take it that his propeller is at the rear end of the machine. The words which Mr. Blondin quotes from "Vehicles of the Air" are probably spoken of an aeroplane with its propeller forward. I cannot speak this with certainty, for I have not had access to the book, but the idea seems quite reasonable to me.

Now, it will be readily seen that this gyroscopic action will be exactly opposite in two aeroplanes, one having the propeller at the rear and one having it forward, provided that the propellers of each are revolved in the same direction; that is, observing each from the rear, they might both revolve clockwise.

Platte, S. D. GUY M. NASH.

Like a real "joy rider" he swerves from side to side, blowing the horn furiously.

The motorcyclist keeps his balance with the aid of a gyroscope.

The mechanism that makes the "balky donkey" misbehave.

The Ingenuity of the Toy-maker

Pitting Brains Against Cost of Labor and Materials

JUST why a serious, hard-working people like the Germans should engage in making such trifling things as cheap toys is a question which we shall not attempt to answer. The fact remains that in this industry they have the field to themselves. To be sure, the French have a very good reputation as toy-makers. There is something distinctive about their products which places them in a class by themselves; an artistic finish and a delicacy of treatment that cannot be copied by the relatively clumsy Teuton. Nevertheless, many French toys are actually made in Germany and merely assembled and finished in France. Of course, the superior toys demand a correspondingly higher price. Vienna is another center for the better class toys, while Switzerland makes a specialty of playthings carved out of wood. But in volume of business, and variety and cheapness of product, no nation can compete with Germany.

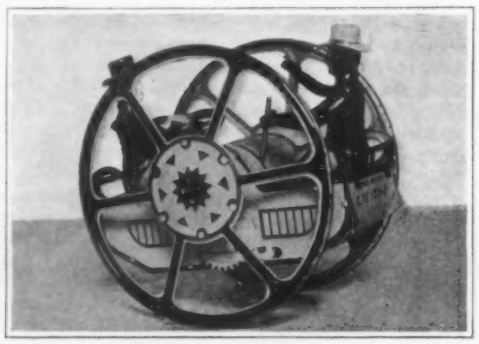
In and about Nürnberg the toy-maker's trade has been handed down from generation to generation. Entire families engage in the work, even the children spending precious playtime hours making baubles and gewgaws for the amusement of their little brothers and sisters in other lands. The work is done at home, and the product is collected by agents of the large dealers.

It is not in this home work that we are at present interested, but in the mechanical tin toys that must be manufactured in factories. These frail toys, guaranteed to wear out before the child tires of them, possess such ingenuity of construction and mechanical movement as even to astonish and excite the admiration of a Yankee. The handy man who has tried to repair a mechanical toy learns something of the cleverness hidden in these animated creations of tin and paint. It is well worth one's while to investigate the subject and note how brains have been pitted against cost of labor and materials. One may well marvel at the skill with which two-dimension stuff such as sheet metal may be made to perform work that ordinarily requires three-dimension parts such as castings and members machined from block metal.

To make the figure of a man or an animal, pieces of sheet tin plate are stamped out and shaped to form the two halves of the body and limbs. These are put together and fastened without solder, for soldering takes time and requires skilled labor, but with little tongues left projecting from the edges of the two pieces. A pair of tongues are slipped through a tiny washer and bent back, as shown at *A* in Fig. 1. Here and there along the seam will also be seen other fastenings, consisting of a tongue on one piece fitting snugly between a pair of tongues on another, as shown at *B*. The object of this is to keep the two parts firmly against movement endwise. A common method of attaching the legs and arms, if they are to have movement relative to the body, is to form them with a lug and two laterally projecting ears which are folded upon themselves to pass through a slot in the body, after which they are unfolded to hold them in place. The slot may be in the form of an arc, the length of which will limit the movement of the limb.

The time honored motor for a mechanical toy has been a clock or watch spring. Recently, however, an enterprising toy manufacturer has introduced a common wire coil spring. This has been found much more satisfactory, as it is much less liable to derangement. Formerly the keys with which these springs were wound were miniature clock keys made of cast metal. Not

A mutilated gear and a pair of eccentrics explain the action of the "zigzag."



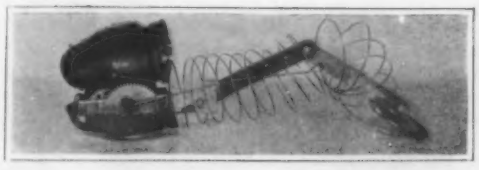
The struggles of two contending drivers send the vehicle hither and yon.

The cantankerous beast runs forward and backward with equal facility.

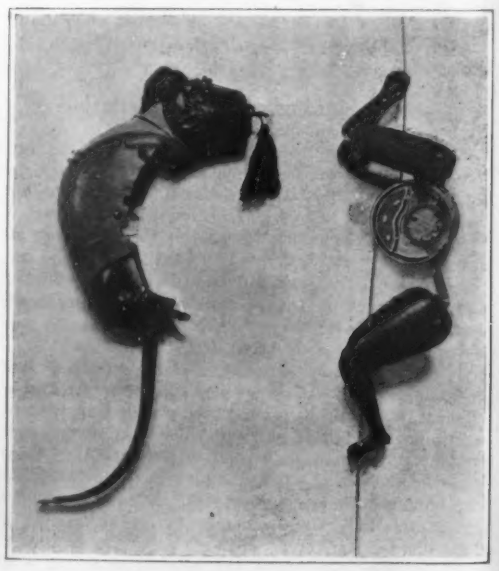
This jolly, care-free negro dances the "double shuffle" to perfection.

The lizard wriggles backward as well as forward.

A repulsive-looking inch worm.

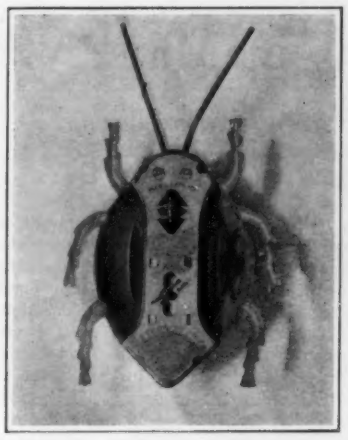


The inch worm dissected.



The inner workings of the classic climbing monkey contain no springs.

This ladybug never falls off the table. The ventral side shows why.



A noisy buzzing beetle and the mechanism that works the legs.

only did these keys add expense to the toy, but they were constantly being lost. The more modern method is to make the key part of the toy. Furthermore, the key itself is made of sheet metal bent into shape as indicated in Fig. 2. The winding stem *D* has a flat end which is passed through a pair of slots in the rim of a cup-shaped piece of tin *E*. Another cup-shaped piece *F* has a slotted projection which fits on the stem over the first cup-shaped member, and is then securely fastened in place by means of a pair of fingers *G*, which are bent around the stem below to form a collar. The result of this is a very strong and substantial key, that will not slip off and which costs approximately nothing, for it can very quickly be assembled with cheap labor.

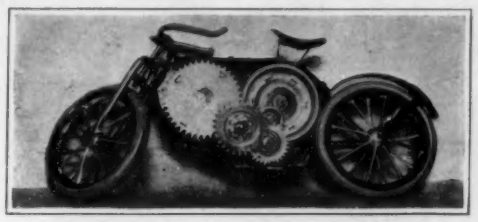
Formerly it was necessary to use gear wheels cut from heavy metal. Now the gears are stamped out of sheet metal. Bevel gears are unnecessary because a tin spur wheel will mesh with another at right angles to it. To transmit motion in the same plane the teeth of one of the gears must be bent over to form a crown wheel or a "lantern" wheel may be used. This is commonly formed of two parts shown at *H* and *I* in Fig. 3. The star-shaped member is bent into a cage or lantern and is held in this position by passing the ends through slots in the disk and bending them back. When a train of gears is to be used the disk *I* is usually formed with teeth so that it may mesh with another lantern pinion.

In order to obtain odd mechanical movements use is made of mutilated gears and cams. Some odd motions are obtained by means of eccentrics. One of the simple forms of eccentrics consists of a strip of metal *J*, Fig. 4, which is folded about the power shaft. In the two projecting ends of this strip are notches adapted to receive the eccentric strap. Another form of eccentric which is very cheaply made consists of three tongues struck up from a disk and hooked over the eccentric strap, as shown in Fig. 5.

To prevent the gear train of the common toy from racing various governors are used. Ordinarily the speed is controlled by an eccentric weight. The uneven motion produced by this unbalanced weight is sometimes employed to make the toy dance. One of the recent toys on the market consists of a Chinaman with a queue that can be pulled out to an enormous length. When this is released a spring rewinds it, setting an eccentric weight in motion which makes the Chinaman dance about in great excitement.

Quite a different mechanical movement is employed in the Jigging Coon, which proved to be a prime favorite this past season. The figure in this toy is made to dance in a most realistic manner, doing the double-shuffle to perfection. The clock movement in the box on which the coon dances, drives a hub with curved spokes or fingers *K*, Fig. 6, that strike the blades of a fan-like wheel *L*. The wheel is lifted by the fingers and also turned at each stroke owing to the inclination of the blades, but it drops between strokes under the weight of the figure which it supports. Thus, the figure supported by the fan wheel is intermittently lifted and turned around with an irregular motion, and his weighted feet are thrown this way and that owing to their own inertia. The speed governor on this toy consists of a friction brake on one of the gear wheels which may be applied by hand with any pressure desired.

Other forms of governors are shown in Figs. 7 and 8. They are but variations of escapements such as used in clocks. A weighted arm is provided with a pair of pallets adapted to be engaged by the teeth of an escape wheel. In one case a crown wheel is used with the pallets engaged at opposite sides of the center, while in the other case the teeth of the escape wheel are bent alternately to the right and left of the plane of the wheel and engage first one prong and then the other prong of the forked lever.



Showing the gyroscope under the saddle.

The latter form of escapement is used in a toy that proved one of the most popular of the past season. This was known as the "Educated Ladybug," which would walk slowly to the edge of the table, but as soon as its antennæ felt the edge it would turn quickly and avoid dropping off The action of this toy is so true to life as to make one almost believe that at last the toy-maker had equipped his tin machine with a real brain. But the marvel is easily explained. The ladybug rests upon two toothed wheels and one of its antennæ. Only one of the wheels is directly secured to the power shaft, namely, the one shown at the right in our photograph of the inverted bug. There is a third toothed wheel under the head of the bug whose axis is at right angles to that of the driving wheel. Normally this does not touch the table, but when the bug falls forward slightly as its antenna passes over the edge of the table, the wheel comes in contact with the wood and prevents the bug from going directly forward. As the power drive is at one side the bug must turn in the opposite direction.

Biologically associated with the ladybug, although anatomically very different, is a noisy beetle which walks along very realistically, with wings buzzing like a June bug. The under side of this beetle shows a connecting rod attached to the front and rear pair of legs at opposite sides of their centers. This rod is given a reciprocating motion by crank connection with the driving mechanism. Thus the legs are operated and by a very ingenious expedient a wabbling motion of the rear legs is produced, so that first one side and then the other is lifted clear of the table. The short stud on which the rear legs are mounted has a hinge bearing at one end, but adjacent to the connecting rod it is supported in a slot in the frame plate. The rocking motion permitted by this slot serves to lift the advancing leg clear of the ground. The wings are vibrated by pitmans.

A toy which has proved very amusing to children, owing to its unexpected behavior, is a lizard made up of pieces of wood, connected as shown in Fig. 9 by two cords that run in grooves in the wooden blocks at the top and the bottom. This provides a very flexible body for the lizard which is painted to imitate life. The lizard moves on wheels. Two pitmans run from one of the wheels to the neck and the tail of the lizard so that the toy pursues a serpentine course as it travels across the floor. In some of the lizards the driving gear is a crown wheel with teeth on only one-half of its circumference. It engages first a pinion on the right hand side and then a pinion on the left hand side. Of course, these pinions being on opposite sides of the center are intermittently moved in opposite directions. As a consequence of this reverse movement the lizard will wriggle forward first and then unexpectedly stop, and run backward.

While dealing with creeping and crawling things we must not overlook the inch worm, a most repulsive looking object which measures its way along the ground in characteristic fashion. We have torn off the flannel skin of this worm to expose its vitals. The body consists of a coil of wire spring, while the backbone is a pair of jointed levers, one of which is connected by

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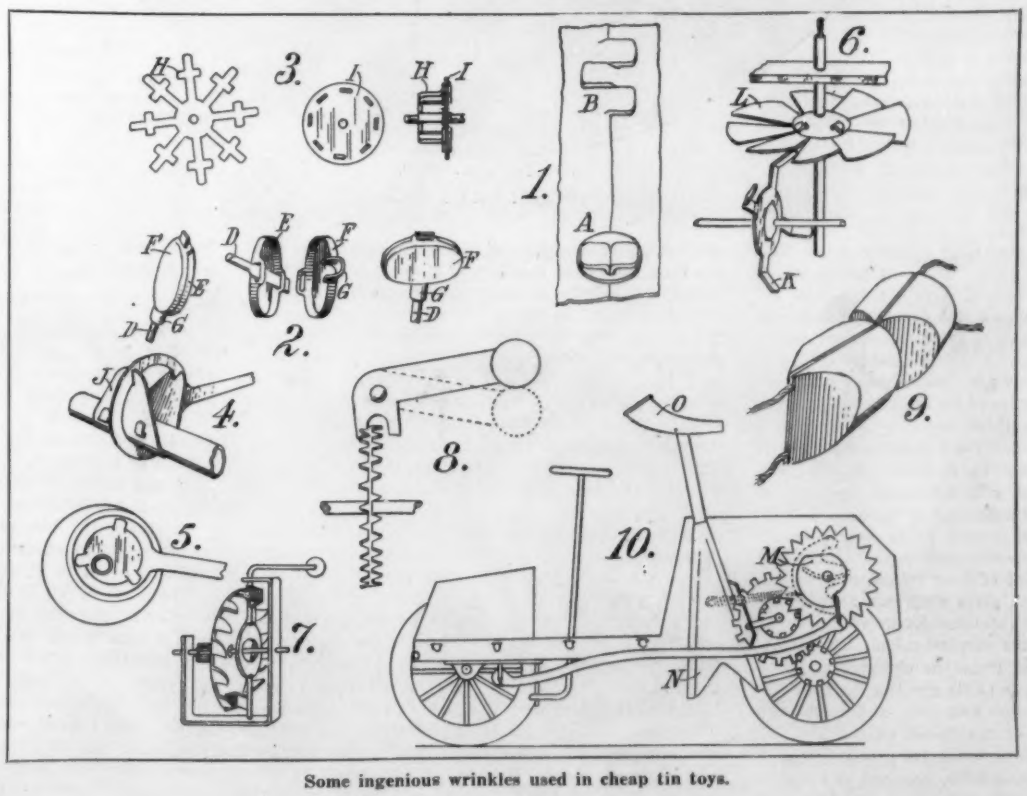


Some ingenious wrinkles used in cheap tin toys.

The Heavens in May

Jupiter's Interesting Family of Satellites

By Henry Norris Russell, Ph.D.

In the southeastern sky, as the evening advances, a brilliant object, brighter by far than any of the surrounding stars, rises higher and higher. Its very brightness, and the fact that it does not twinkle, would mark it as a planet, and even the novice may identify it at once as Jupiter. Two other planets—Venus and Mars—may appear as bright as this; but Venus is always in the part of the sky near the sun, and can never rise in the evening; while Mars is brilliantly red, and the planet now observed is white. By this process of exclusion we may assure ourselves, without troubling to consult an almanac, that we are looking at Jupiter; and, needless to say, the almanac will confirm our reasoning. Though in opposition on the last night of the month, Jupiter is not well placed for observation in the northern hemisphere, being 21 degrees south of the celestial equator, and reaching at most an altitude of 28 degrees above the horizon (as seen from New York). In consequence, we have to look through twice as much air, along the line of sight toward the planet, as would be in our way if he was at an equal distance north of the equator; and the inevitable unsteadiness of the images, due to the small changes in atmospheric refraction which are continually taking place, is increased in a still greater proportion.

Nevertheless, much may be seen, with even a small telescope, in the vicinity of this, the greatest of the planets, and much more will be revealed by careful and repeated observation than would seem likely to the mere casual onlooker. The smallest instrument—even an opera-glass—will show the two outermost of the four large satellites which attend him; and one of but slightly greater power will reveal all four. By making sketches of their apparent position, with reference to the planet, the amateur may easily satisfy himself, as Galileo did, that they are apparently oscillating back and forth from side to side of the planet, which of course means that they are really going round it in nearly circular orbits, seen almost edgewise. The outermost satellite takes 16¾ days to complete a revolution. The next inside, which is the brightest of the four, 7 days 4 hours, and the inner ones 3 days 13 hours and 1 day 18½ hours. At the end of a week all three of these return very nearly to their original positions. The first satellite (counting outward from the planet, as is usually done) will have made four complete circuits of its orbit in the interval, the second, two, and the third, one.

It may be well to remind the inexperienced observer that the satellites which at a given moment seem farthest from the planet may not really be the most remote. The fourth and outermost of them may, at the moment we look at the system, be so nearly in line with the planet as to appear nearer to it than the first, though really far in front of it or behind it.

The Nautical Almanac gives diagrams showing the relative positions of the satellites for every day in the year, which make even the simplest calculation unnecessary. In the absence of these the observer may note that the fourth satellite is at its greatest distance west of the planet on May 3rd and 19th, and in a corresponding position east of the planet on the 11th and 27th. The third satellite is at its greatest western elongation on the 3rd, 10th, 17th, etc., and on the opposite side on the 6th, 13th, 20th, etc. The two inner satellites move so rapidly that it is hardly convenient to follow them in the same way.

The amateur, even though his telescope is very small, who desires to carry his study a little further, will find it of interest to attempt to measure the distances of the satellites from the planet. This requires no costly micrometer; it is only necessary to set up any straight edge—say a piece of wire—so as to come into focus in the field of view along with distant objects; to turn this so that it lies at right angles to the direction in which the stars seem to drift in the field, owing to their diurnal motion; and to note as closely as possible the instants when the satellites and the two edges or "limbs" of the planet disappear or reappear behind the wire. The difference of these times will give the east-and-west distance of the satellite from the planet. By plotting the observations of successive nights, the relative distances of the satellites at elongation may readily be found. Such observations are of course rough, neglecting the varying distance of Jupiter, its actual motion in the heavens, etc.; but they ought to be good enough to give a rough test of Kepler's famous "third law" that the cubes of the distances of the satellites from the planet are proportional to the squares of their periodic times. Many other interesting applications will suggest themselves to the enthusiastic student.

At the present time we do not see the orbits of these satellites exactly edgewise, but at a small angle, so that the fourth satellite appears to pass just north of the planet when on the near side of its orbit, and just south of it when on the far side. The other three satellites, however, actually pass in front of the planet, at every evolution, and also behind it, so that they are eclipsed in its shadow. These phenomena are of very frequent occurrence, but none the less interesting—especially the transits, when the satellite and shadow may both be seen on the planet's disk. The former appears as a bright speck, when near the planet's edge, but usually dark when projected upon the planet's center, which is much brighter than the limb. The shadows are of course always black. It is especially interesting when two satellites or their shadows are in front of the planet at once. This can be observed twice during the present month—on the 9th, when the shadow of the third satellite enters upon the planet at 7:28 P. M. (Washington time) and leaves it at the other side at 9:33. At 9:41 the satellite itself enters upon the disk, and, before it passes off, the shadow of the first satellite enters at 11:16. At 11:33 the third satellite emerges from the planet's disk, and at 11:48 the first satellite passes in front of the planet to leave it at 2 A. M. while its shadow has already passed off at 1:30.

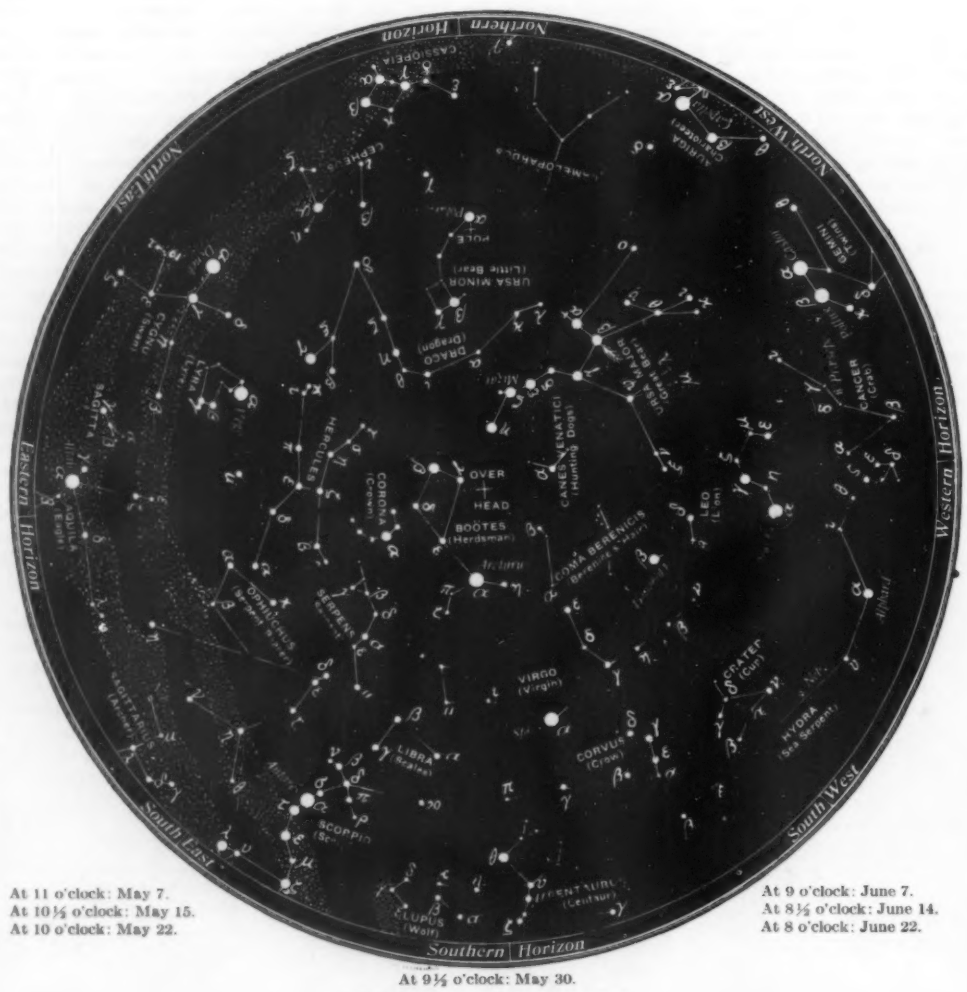
On the night of the 13th the shadow of the third satellite enters upon the planet at 11:26 P. M. followed by the satellite itself at 1:00 A. M., and by the shadow of the first at 1:10. At 1:32 the shadow of the third satellite passes off, just as the first satellite enters upon the opposite side of the planet's disk.

It requires a telescope of several inches aperture to see the satellites themselves in front of the planet; but a very small instrument will suffice to follow them almost to the moment of contact. A large instrument (from the amateur's standpoint) of eight inches or more in aperture, shows that the satellites possess sensible, though small, disks—their actual diameters being from 2,000 to 3,500 miles.

Turning to the starry skies, our map shows us how to find the great orange-yellow star Arcturus, due south of the zenith and high up. Below it and a little to the right is the fainter Spica, in Virgo. Scorpio, now rising in the southeast, is made very brilliant by the presence of Jupiter. The three bright stars in the east are, from right to left, Altair in Aquila, Vega in Lyra, and Deneb in Cygnus.

In the northern sky we find Cassiopeia, low down beneath the Pole; Ursa Minor and Draco higher up and the Great Bear high in the northwest. Auriga and Gemini are setting in the northwest. Leo is well up in the west with Hydra below him.

The new star in Gemini has sunk to about the seventh magnitude, but is still easily visible in an opera-glass. Its spectrum now presents the typical appearance which so many Novæ have exhibited—broad, bright and dark bands, widely displaced.



At 11 o'clock: May 7.
At 10½ o'clock: May 15.
At 10 o'clock: May 22.

At 9 o'clock: June 7.
At 8½ o'clock: June 14.
At 8 o'clock: June 22.

At 9½ o'clock: May 30.

NIGHT SKY: MAY AND JUNE

The Planets.

Mercury is morning star in Aries, and is at his greatest elongation on the 13th. About this time he rises a little before 4 A. M. Venus is likewise a morning star, rising about three-quarters of an hour after Mercury. Mars is evening star, on the borders of Gemini and Cancer, and sets about 11:20 P. M. in the middle of the month. Jupiter is in opposition on the 31st, and visible all night long. As already described Saturn is in conjunction with the sun on the 14th, and hence invisible. Uranus is in Capricornus and comes to the meridian about 5 A. M. Neptune is in Gemini, and sets about 11 P. M.

The moon is full at 4 A. M. on May 1st, in her last quarter at the same hour on the 9th, new at 4 P. M. on the 16th, in her first quarter at 8 A. M. on the 23d, and full again at 5 P. M. on the 30th. She is nearest the earth on the 19th, and farthest away on the 7th. She is in conjunction with Jupiter on the 3d, Uranus on the 7th, Mercury on the 14th, Venus on the 15th, Saturn on the 16th, Neptune and Mars on the 20th, and Jupiter once more on the 30th.

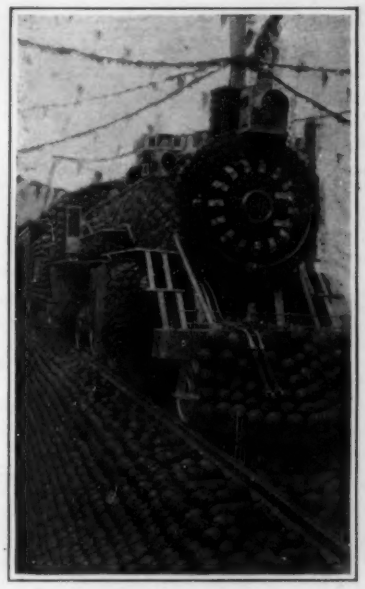
Princeton University Observatory.

Curiosities of Science and Invention

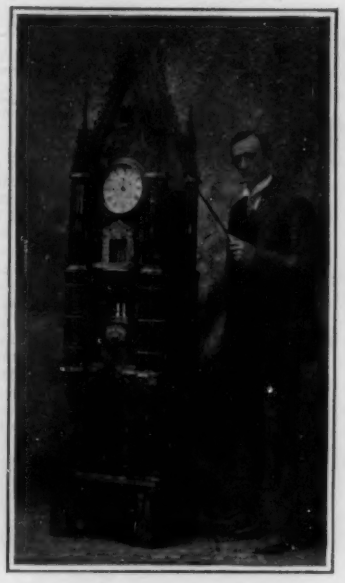
READERS are invited to contribute to this department photographs of novel and curious objects, unique occurrences, and ingenious contrivances. Such as are available will be paid for promptly.

A Citrus Train

A FEATURE exhibit, which was awarded first prize at the Second National Orange Show, San Bernardino, California, February 19th to 24th, 1912, was a train made up of lemons, oranges and grape fruit. It was entered by the Santa Fé Railroad Company, and built entirely in their shops at San Bernardino. The train is complete to the most minute detail; not a feature or part of the equipment is missing from this miniature train that is found on the standard trains of the company. The train crew is represented by wax figures properly uniformed, and even the ever-present hobo is cozily ensconced on the truss rods of the refrigerator car. The engine is almost entirely covered with oranges and grape fruit, while the track is ballasted with lemons.



Built of lemons and oranges.

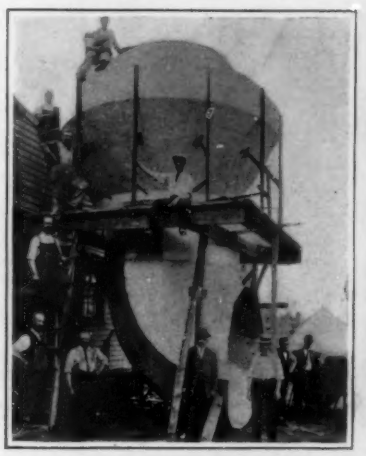


A performance every ten minutes.

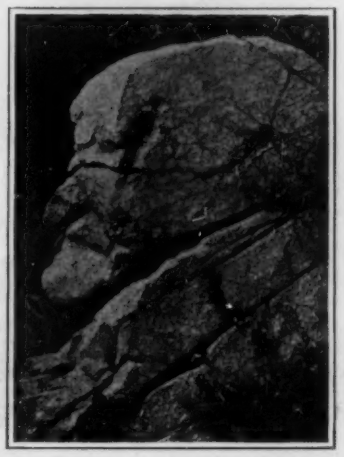
The Largest Ventilator in the World

THE accompanying illustration shows the construction of a great ventilator and elbow for the heating and ventilating system of the Hotel Raleigh, Washington, D. C. In this hotel seventy-five tons of sheet metal are used for the indirect system of steam heating, with an extensive system of ducts leading from the fans across the basement to the various flues carrying the warm fresh air to the different apartments, from which the ventilating ducts are carried to the roof of the building and gathered to discharge into this large ventilator.

The ventilator seen in the photograph is 14 feet in diameter over all, and the elbows 8 feet 5 inches in diameter. They were built in sections suitable for shipment. The weight of the ventilator alone is about 1¼ tons, while the elbow, made of 16-gage galvanized iron, weighs over ½ ton.



Largest ventilator in the world.



The "old man" of Mt. Wilson.

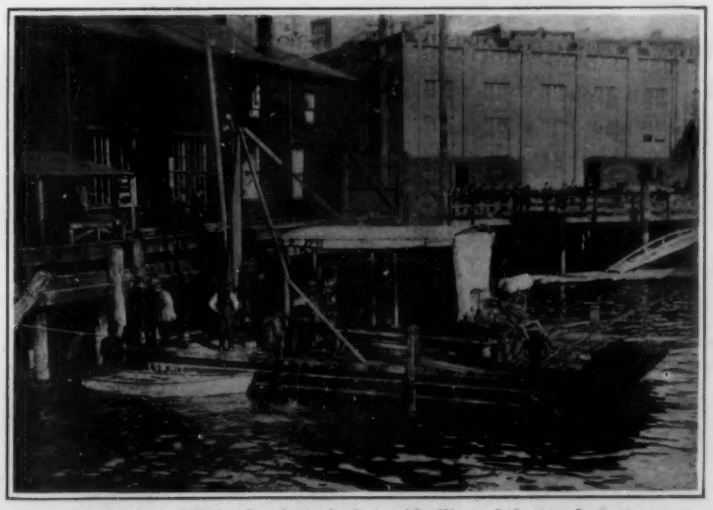
Reinforced Concrete Street-paving

THE novel use of woven wire mesh as a reinforcement for concrete street pavement is shown in this photograph of a partially finished street in Plymouth, Wisconsin. The wire was laid upon the concrete bed and the surface was filled in above it, making a tougher mass and one less likely to crack from heat or cold than the plain concrete. This pavement was laid in the summer of 1910 and has stood remarkably well. The surface is roughened to prevent skidding of automobile tires, granite chips being spread upon the soft concrete surface before it had time to set. These were embedded so as to cause no noticeable unevenness, yet they are a great protection in wet weather and incidentally prolong the life of the pavement. To allow for expansion 1 by 8-inch boards of "pecky" cypress are set along the gutters on edge and at forty-foot intervals over the surface of the street. Thus the pavement is divided into monolithic blocks forty feet square. The boards are set flush with the surface of the concrete; they wear evenly with the rest of the pavement.

Reinforced concrete street-paving.

Fighting the Teredo With Electricity

A FLOATING power plant, equipped for self propulsion, has been tried out on the Pacific Coast in destroying the teredo and similar marine wood borers that attack the submerged timber of wharves. Current is passed through salt water, releasing chlorine, hydrogen, bromine, iodine and sodium-hydroxide or concentrated lye. The teredos are killed within a very few moments, by the great volume of chlorine gas liberated. Only the head of the bivalve and its worm-like body penetrate the wood, while the tail remains at the surface in contact with the water. The effect of the chlorine gas upon its soft and gelatinous structure is to coagulate it. Of course this electrolytic treatment does not render the piling immune from further attack, but it is claimed that an occasional treatment will keep the borers from penetrating to any great depth, so that the timbers can be preserved indefinitely at a comparatively low charge. The operation of destroying the teredos is not at all complex. The wharf is first wired and electrodes are suspended from it so as to be submerged at a greater or less depth, the details varying with local conditions. The power plant on a barge has a capacity of twenty to forty thousand amperes, but the voltage is exceedingly low. The current is turned on for about an hour, and the operation is timed so that the action of the tide will help rather than hinder the process of chlorination.



Generating chlorine by electrolysis to rid piling of the teredo pest.

An Elaborate Cathedral Clock

TWENTY thousand minute pieces of wood entered into the construction of an elaborately ornamented Notre Dame cathedral clock made by James Calway of Skowhegan, Maine. This clock, which is finely carved, stands 7 feet and 10 inches in height and took Mr. Calway six long years to complete.

In the upper story six folding doors open every ten minutes and the apostles appear marching in time to an air played by a large music box that is governed by the clock, each one bowing before the Saviour as they pass, except the fourth one (which represents Peter), who turns his back upon the Saviour, and the devil comes out of the top of the clock and blows a trumpet in honor of Peter.

The second story is in the form of a mansion with double doors in front which also open every ten minutes. Lazarus appears at the rich man's door and on bended knees asks for charity, the dogs licking his sores, and the rich man stands in the door swinging his arm as if he were throwing crumbs from his table. All these moveable figures are run by machinery connected with a time movement, so as to work on the minute. The bottom story is a very elaborately designed foundation of fine inlaid work.

The "Old Man" of Mt. Wilson

MORE striking than the "Great Stone Face" celebrated by Hawthorne, is the rock profile on Mt. Wilson, California, a face of an old man with strong features and full of expression, which is probably the most wonderful of nature's carvings in existence. The skull is well formed, the forehead lofty, the eyebrows jutting, and the aquiline nose is exceedingly vigorous. The mouth is hard and set, but complete in detail, and even the line from the nostril to the corner of the mouth and the rugged modeling of the cheek is distinctly marked. The chin and jaw are correctly sculptured, and even the line of the high collar and old fashioned coat may be seen on this remarkable boulder.

A Soap-driven Boat

A WRITER in *Science* tells of an ingenious little skiff, about two inches long, which he constructed and provided with a piece of soap for the motor. The boat was of wood paraffined to repel the water. The soap formed the stern board of the skiff. The boat was placed on still water in a bathtub, and began to move as soon as the water came in contact with the soap. After gathering headway it reached a velocity of two inches per second. The power was derived from the potential energy of the surface water film set free by the diminution of surface tension, this reduction being due to solution of the soap.

What Inventors Are Doing

Simple Patent Law; Patent Office News; Inventions New and Interesting

The Safety Boat Service on Board Steamships

The Importance of Effective Means for Launching Life-boats.

THE "Titanic" disaster has brought to public attention and placed under discussion every aspect of transatlantic navigation in any way relating to the safety of the passengers. Especially has the life-boat service been the subject of criticism, as the number of boats provided was utterly inadequate to take care of all the passengers on board. The arrangement of life-boats on the deck, as originally planned, is shown in the accompanying line drawing. There were to be three rows of boats along each side. In point of fact, there was only a single row of boats provided, and one extra boat at each end, making twenty in all. One of the extra boats at the time of the accident was, for some unknown reason, on the roof of the officers' deck house, and could not be reached by the davits. The latter were the invention of Axel Welin, and deserve special attention.

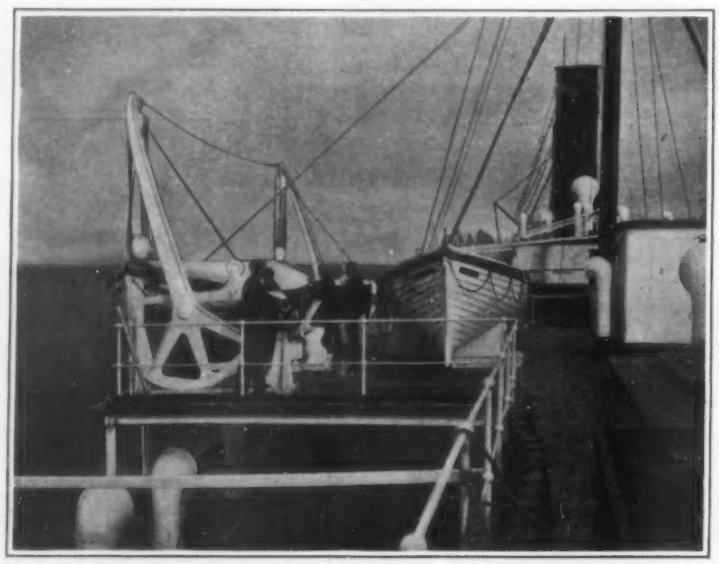
A very good view of a Welin davit is shown in our accompanying illustration. It is so mounted that it can be swung in position to handle any one of two boats, or three, if some of them are collapsible. The operation is exceedingly simple and rapid. The importance of this in the case of the "Titanic" disaster was only too apparent. There was a scarcity of sailors on board, and in fact, after launching the second boat on the starboard side, there were no seamen left, and the remaining boats must have been launched by stokers, stewards, passengers, etc. To a layman the significance of this is perhaps not obvious, but sailors know that with the old run-board system of davits it would have been impossible to carry out. Moreover, immediately after striking the iceberg the "Titanic" had a very considerable list, and had she been equipped with old run-board davits only one-half the boats, namely those on the lower side, could have been launched, for it is impossible with the old system to launch a boat when the vessel is heavily listed. In point of fact, all the boats, so far as we know, were safely and effectively launched in about fifteen minutes. This is remarkably quick work and vastly superior to anything that could have been done with the old system. The feat is all the more noteworthy as the boats were no less than seventy feet above water line, which of itself is a record.

The subject of davits and related matters is very lucidly discussed in an article by W. A. Stevens, which appeared last December in *Cassier's Magazine* on "Boat Equipments on Ocean-going Steamers." Some of the passages from this article are well worth quoting, especially as, in the light of the recent catastrophe, they have acquired, as it were, a prophetic significance. Thus, for instance, the writer says:

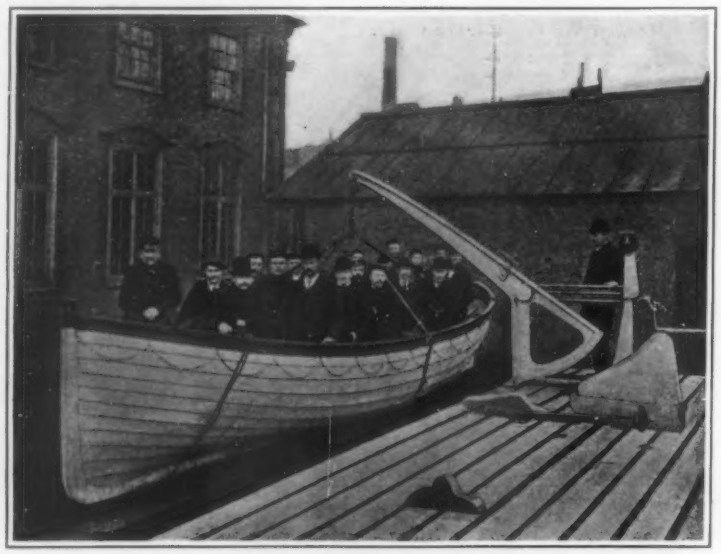
"It has been argued, so perfect is the subdivision of these vessels, the arrangement of their watertight bulkheads and compartments, that they are practically unsinkable, and that the boat accommodation is, therefore, after all, only a matter of minor importance. Experience has, however, speaking generally, produced in seafaring men and shipowners a very wholesome regard for that trite old proverb relating to the happening of the unexpected. Risks of some sort there must always be; such, for instance, as that of a disabled liner, with her wireless carried away, drifted or blown out of her course, badly on fire in some remote part of the ocean, far from the recognized steam lanes; the deadly crash into some treacherous, fog-shrouded mass of ice, whose bulk—easily equaling that of the vessel itself—may, in a moment, inflict such damage as to render futile the most cunning scheme of doors or sub-divisions, and to make an immediate recourse to the boats at least a desirable precaution, if not a lamentable necessity. There remain, too, other risks, and consequently the general tendency, in spite of a few adverse critics, is to improve rather than to neglect the efficiency of safety appliances."

As regards the author's last point, it must be remarked that while the equipment of the "Titanic" seems to have been good in kind it was, unfortunately, inadequate in scope.

The necessity of improving the old system of davits has been long felt and expression has been given to this fact by innumerable applications filed in the Patent Office for devices of this kind. However, out of this host only a very few seem to have come into practical use.



The swinging davit is designed to handle two rows of boats expeditiously.



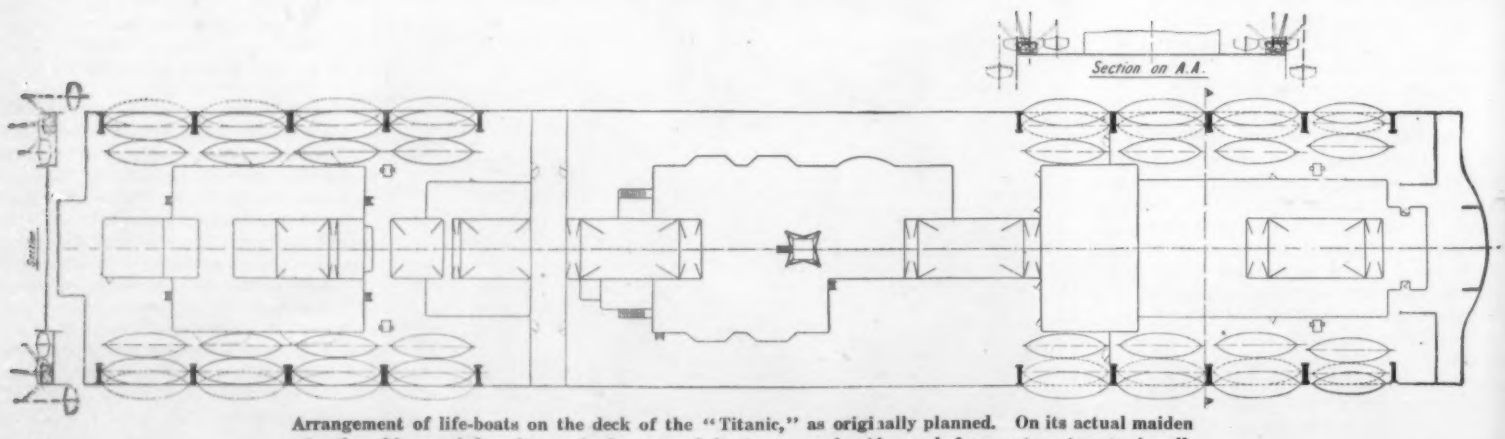
Testing a davit before delivery.

Notes for Inventors

A New Automobile Horn.—An automobile horn has been invented which warns without offending the ear. This result has been attained by experimentation with various shapes and sizes of instruments to obtain the maximum of carrying distance with the minimum of harshness. The horn is a small instrument which can be easily attached to the muffler outlet by a coupling and is so fashioned that, when not in use, the exhaust gases flow freely through it without sound. When the warning sound is desired, the operator presses a foot lever which moves a plate across the exhaust vent and changes the direction of the exhaust, forcing it across the mouth of the sound chamber. The device is an adaptation of the boy's whistle, differing from it in that provision is made for the constant flow of the exhaust when the horn is not in use.

The Talking Machine Record-stop.—"Let the record-stop stop the record" is the suggestion of an inventor who has just devised an electric brake for the phonograph. It operates automatically and stops the unpleasant scratching and whirring of the needle which usually follows the last bars of music on a phonograph record. It obviates the necessity of the listener preparing himself to spring out of his chair as a selection nears its close so as to shut off the motor, and these features should make it popular. The new invention is very simple and compact, a plated case that lies in the palm of a man's hand contains all of the mechanism but the dry cell. The latter is wired to the brake and can be set at any point that is most convenient. The brake itself is screwed to the case of the talking machine and requires no skill to adjust. A lever that comes in contact with the metal arm of the phonograph is moved by a touch of the finger so that when the needle has reached the end of the record, the arm and the lever will be in contact. This adjustment is made before playing each record. Then the needle is set back to the beginning of the piece, the selection is played through and at the close the lever and the arm of the phonograph are once more in contact. This closes the circuit and throws on the brake, shutting off the motion of the disk at once.

Patents and Trade-marks in Panama.—While by executive order the protection of the patent, trade-mark and copyright laws has been extended to the Canal Zone and no formality is required for the said zone to secure the protection afforded by the grant of such rights in the United States, this does not apply to Panama generally. The republic of Panama has distinct laws governing patents and trade-marks and ap



Arrangement of life-boats on the deck of the "Titanic," as originally planned. On its actual maiden trip the ship carried only a single row of boats on each side, and four extra, twenty in all.

plications must be prepared and prosecuted under said laws. Foreign trademarks and patents must first be protected in the country of manufacture and patents lapse if not worked in the first third of the period for which they are granted.

A Bread-wrapping Machine Wanted.—In one of our large cities, an active movement is on foot to induce and compel, if necessary, the wrapping of bread, cake and other bakers' products when placed on the market. A local paper suggests that fortune awaits the man who will devise a machine for wrapping bread in suitable paper. The machine should be adapted to wrap and seal bread after it has cooled, and if provision can be made to expose the loaf or part of it to view without breaking the seal or wrapping, so much the better.

The Hearing on the Patent Bill

By Our Washington Correspondent

THE first day's hearing on the Patent Bill before the Patent Committee was well attended. Among those present was H. Ward Leonard, a well-known inventor of electrical apparatus, who has taken out about one hundred patents and has passed through thirty-four interferences; and Dr. L. H. Baekland, inventor of a widely used photographic developing-paper.

First to be heard was Edward Fairfax Naulty, an inventor of mail-chutes. He talked for an hour and suggested many amendments, most of which appeared to be unimportant. Then came Mr. Leonard, who also talked for nearly an hour, recounting chiefly his personal experiences. Mr. Leonard had decided views on the subject of compulsory licenses. He contended that the prime stimulus to invention is fame, the fame of having accomplished an important task. He thought it wise to compel public service corporations to do certain things, such as the electrification of the New York and New Haven Railroad at its New York terminal. In such instances, he thought, public service corporations should not be held up by particular patent interests. But on the whole, Mr. Leonard was not in favor of compulsory licenses. He pointed out that under the bill, German inventors were better off than Americans so far as compulsory licenses were concerned. The bill accepts manufacture in Germany in lieu of manufacture here, as against compulsory license.

Mr. Leonard also referred to the custom of keeping inventions secret. As an instance he cited an enameling process which he has not disclosed and which he is carrying out secretly rather than to make it public by patents. To illustrate how a large corporation affects individual inventors, he filed with the committee correspondence which passed between him and a large company. Mr. Leonard told the committee that a patent pool had been formed by two large companies, which was dissolved last April after threats of prosecution by the Attorney-General. It was the object of the pool to force an inventor to grant a license not simply to the one company, but to the other as well.

A good patent system, said Mr. Leonard, is the surest way to protect the country against the evils of monopoly. He stated that the Sherman Law and the Patent Law should go hand in hand in protecting the country against monopoly. Mr. Leonard also raised the question whether the bill, as drawn, would apply to patents of the past, the future, pending applications or only those that may be filed subsequently to the approval of the act.

Mr. Leonard was followed by Dr. H. Backland, who is a chemist and an inventor of a well-known photographic paper. He told how he kept the process of making the paper secret, how he sold the process after making it a commercial success, and how it is still being carried out secretly.

The feature of the bill which relates to the Board of Appeals is likely to be objected to by many attorneys who fear the Commissioner is given too much authority in its deliberations. Some attorneys argue that this feature of the bill is designed to perpetuate in office the Commissioner and the Assistant Commissioners.

RECENTLY PATENTED INVENTIONS

These columns are open to all patentees. The notices are inserted by special arrangement with the inventors. Terms on application to the Advertising Department of the SCIENTIFIC AMERICAN.

Pertaining to Apparel.

GARMENT.—A. GOLDBERG, 134 West 26th Street, Manhattan, New York, N. Y. This invention refers to garments such as dresses for school children, saleswomen and others, and has reference more particularly to a garment which includes a skirt having a part reversibly secured thereto and normally concealing any underlying part of the skirt, and means for fastening the reversible part in different positions.

GARTER.—E. B. WINTERS, Coffeyville, Kan. The object in this case is to provide a garter having the usual leg band and clasp, together with a resilient member whereby the garter may position itself when in use, this resilient member being designed to perform the function usually accomplished by making the band of rubber.

SWIMMING MITT OR GLOVE.—T. L. MONAGHAN, 17 East 101st Street, Manhattan, N. Y. This invention has reference to swimming appliances, and its purpose is the provision of a mitt or glove for convenient attachment to the hand of a person with a view to keep the fingers in the proper position, thus greatly aiding a person in learning to swim.

CLOTHES RACK.—A. A. BOSCHEE, 18 West Walnut Street, Lodi, Cal. In this case, the vertical post has a hollow rectangular body with openings, and a base which supports it. For each opening there is a foldable panel, adapted when folded to fill the opening and lie flush with adjacent portions of the post, and provided with means to receive pivotal ends of the arms. There are three sets of arms, two in each set, whose ends abut when the arms are extended. Each panel with its arms extended serves as a rack and a leg provided with an extension foot holds the device together and supports it.

DIVING SUIT.—C. ANDERSON and M. SILVER, care Myron Silver, Honolulu, Hawaii. This suit may be comfortably worn, is waterproof and airtight, is attachable to a source of air supply under graduated pressure, affords means for a diver's descent in various depths, without subjection to excessive pressure, and enables him to converse with a person on the body of the water over the diver.

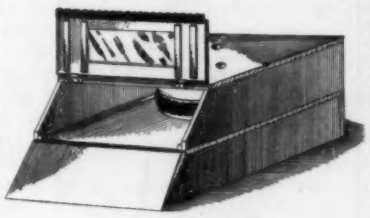
Pertaining to Aviation.

PROPELLER.—J. A. IRVING, 335 Broadway, N. Y. This propeller is designed to disturb the air as little as possible so as to obtain greatest efficiency, while the blades are adjustable relatively to each other and to the hub, to permit of ready adjustment of blades to weight, resisting surface and frictional surfaces of the aeroplane, and normal speed of engine.

AEROPLANE.—A. E. BEAUDETT, 916 North Eighth Street, Albuquerque, N. M. The object in this invention is to provide a simple but efficient device for absorbing and eliminating the shock when alighting. The air in the cylinders slows the upward movement of plungers, and the greater the shock the more resistance is offered by the air. Should a plunger strike the cylinder top, a rubber block prevents damage to the mechanism.

Of Interest to Farmers.

CHICKEN BROODER.—W. O. WITHAM, Route 6, Box 53, Salem, Ore. In this patent the invention has reference to chicken brooders, and the object is to provide one having a heater, curved in cross section, which permits the chicks to get their backs up against the cloth-covered heater, so that their bodies



CHICKEN BROODER.

may be warmed in the natural way. Another object is to provide means for warming the heater, which will use to the best advantage the heat supplied by the lamp. As warm air from terminals passes through the openings shown in the top of the brooder in the perspective view, it will tend to draw with it air from the housing chamber, which will insure a circulation of air.

FRUIT PICKER.—C. H. BAKER, care of Fred. H. Lyon, Cedarville, Cal. The aim here is to provide a device for permitting the operator on the ground to cut the fruit from the twig and convey it into a receptacle without any liability of bruising the same, and wherein the cutting blades are arranged to be operated by the contact therewith of the twig itself.

POULTRY APPARATUS.—E. W. OLSON, Route 5, Walla Walla, Wash. In this invention the improvement relates more particularly to poultry nests, and has for its object to provide an apparatus whereby the number of eggs laid by each hen in a flock for a given period can be easily determined.

GATE LATCH.—E. RAATHS, care E. H. Bramschreiber, Zachow, Wis. The object of this invention is to provide a new and improved gate latch arranged to permit conveniently opening or closing and locking the gate without the use of the hands, and to prevent hogs and cattle opening the gate.

Of General Interest.

PROPELLER.—J. F. NETTLE, Box 1057, Butte, Mont. This invention relates to propellers and the object is to provide a propeller having a blade on the driving face of which there is secured a projecting member to prevent the water from slipping on the said face of the blade. The projecting members or ribs will prevent the water or air from slipping

PROPELLER.

over the driving surfaces of the blades, thereby adding to the efficiency of the blades, without any corresponding increase in driving power. It is preferred to have the ribs tapering in the direction of the free ends of the blades so as to prevent formation of eddies. The projecting members or ribs are also tapered at their terminals so that they offer the least possible resistance. The engraving shows an end view of the propeller.

FENCE POST.—J. W. GOLDEN, Hodges, Mont. Mr. Golden's invention has for its purpose the provision of a simple, inexpensive post especially designed for wire fencing, and having means for detachably holding each wire in place, and wherein a bracing means is provided for the corner posts.

LEG PULLING APPARATUS.—L. J. LE JEUNE, Donaldsonville, La. The invention refers to physical exercise apparatus, and the aim is to provide an apparatus for use in hospitals and other places, and more especially designed for exerting a straight, strong pull on a patient's leg in case the latter is broken or otherwise injured and needs resting or straightening.

POP COOLER.—J. H. CAREY, Davenport, Neb. This invention relates to improvements in devices for keeping cool pop, soda water, ginger ale and other beverages and has for its object to provide a device which shall be cheap and efficient and one in which the beverage to be dispensed can be readily cooled and conveniently handled.

CONDENSER FOR SMELTER FURNACE FUMES.—C. E. M. TAMBACOPOLO, 142 West 30th Street, Manhattan, N. Y. This inventor provides a condenser arranged to insure precipitation of the solid particles and condensation of the metallic and other vapors contained in the smelter fumes with a view to prevent obnoxious gases from passing into the atmosphere, at the same time saving valuable matter of the fumes.

PROCESS FOR THE PROPAGATION OF FISH.—F. PARRY, General Delivery, St. John, N. B., Canada. The invention provides a system for impregnating and incubating fish ova and for preserving the "fry" by subjecting the same during incubation to the action of flowing water in upward and downward direction alternately; and provides a system for the incubation of fish ova wherein parasitic growths to which they are subjected are prevented.

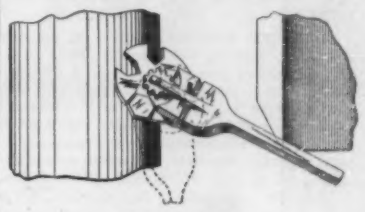
HORSESHOE CALK.—P. S. PALMER, 1818 Shanon Street, Spokane, Wash. This invention relates to an adjustable calk and holder for the same. An object is to use a one size shank for several different sizes of calks. A further object is to provide an attachable or detachable calk which may be any desired slant or height, so that one size calk may be used with any desired size of shoe. The calk is so constructed as to avoid the necessity for tapping or threading the shoe.

Hardware and Tools.

BEER TAPPER.—W. W. FRISHOLM, Leadville, Col. The purpose here is to provide a device for tapping beer and other effervescing liquids which will permit the entering of the device into the keg or other receptacle without waste and which, while permitting the free egress of the liquid, will also permit the entrance of air under pressure to force out the liquid.

BEVELING PLANE.—A. L. SAVAGE, Dermott, Ark. An object here is to provide a plane which will bevel the edge of a board or other similar object to a given depth without the danger of getting beyond the depth or of getting the wrong angle of bevel. A further object is to provide a device in which certain parts may be adjusted so as to fit a rectangular board for the purpose of beveling the edge thereof at the proper angle.

RATCHET WRENCH.—W. G. RUSCOE, Box 65, Stamford, Conn. This invention relates to an improved form of ratchet wrench, a perspective view of which is shown herewith engaging a nut, and also the adaptability of the device for tightening the nut in a place difficult of access. The inventor attains the objects of this invention by pivoting a wheel

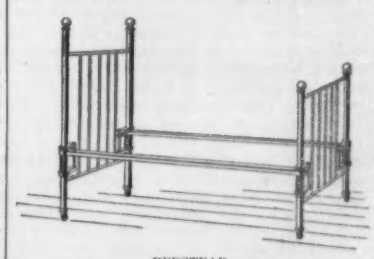


RATCHET WRENCH.

to a handle, which wheel has different sized nut-engaging apertures in the periphery thereof, and by rigidly mounting on the side of the said wheel, a ratchet, which ratchet is adapted to be engaged by one or both of a pair of fingers, to lock the wheel in position, or to permit its movement in a clockwise or anti-clockwise direction, depending upon which way it is desired to rotate the nut engaged by the apertures.

Household Utilities.

BEDSTEAD.—J. PRENDERGAST, care of Janitor, 516 W. 47th St., Manhattan, New York, N. Y. In the present patent, the object of the inventor is to produce a bedstead in which the side rails are connected to the head and foot boards in such manner that they may have a vertical sliding movement with relation to the head and the foot boards, and to provide the head and the foot boards with



BEDSTEAD.

spring supports for the ends of the side rails so that the side rails will be yieldingly supported, and thus render the use of the ordinary springs or other yielding supports for the bed, unnecessary. The invention is particularly directed to producing a metallic bedstead having the novel features above set forth, and it is shown in a perspective view in the accompanying illustration.

APPARATUS FOR ADAPTING BEDS OF THE ORDINARY TYPE FOR THE USE OF INVALIDS.—R. M. MCGARY, Mechanicsburg, Pa. In this instance the invention has reference to beds, and it has for its purpose to provide an apparatus which may be used in connection with beds of the ordinary type and which will enable the nurse to readily raise a stretcher, on which the patient rests, to a position above the mattress of the ordinary bed.

SHADE AND CURTAIN HANGER.—P. J. EVELEIGH, 238 Ashley Ave., Charleston, S. C. The principal object in this case is to provide a hanger made up of parts movable relatively to each other whereby the device may be adapted to windows of different widths in order to support curtains and shades, the

SHADE AND CURTAIN HANGER.

use of such a device doing away defacing the woodwork. A further object is to provide a device which is adjustable in its make-up, the device being adapted to be positioned between opposite sides of a window casing in order to support shades and curtains. The view presented in the engraving herewith shows the shade and curtain hanger in operative position.

Machines and Mechanical Devices.

PERFUME VENDING MACHINE.—A. F. VOEGE, care of Specialty Manufacturing Company, South Bend,, Ind. In view in this invention, is a piston actuated atomizer strapped or otherwise fastened on the outer side of a

case, the fastenings being removable to release the atomizer only from within the case, and the atomizer provided with a coin-actuated mechanism within the case to lock the piston against retraction in successive positions as it is advanced, and lock the piston after being fully advanced, against advancement in successive positions as the piston is retracted.

CONTROLLING DEVICE FOR AEROPLANES.—R. C. BRANDT, Oroville, Cal. The purpose in this instance is the provision of a new and improved controlling device for monoplanes, biplanes and other forms of aeroplanes, and arranged to insure stability of the aeroplane and to permit proper steering without danger of upsetting while passing around sharp curves.

PRESSURE REGULATOR.—I. J. RALSTON and J. A. BRIGGS, 515 Bayard Street, Kane, Pa. An object here is to provide a regulator whereby the pressure of the air or other fluid supplied to the interior of a cylinder or receptacle will be automatically regulated by the pressure in the cylinder or receptacle itself. Another object is to provide a regulator adjustable to vary the timing of the action.

CEMENT FINISHING MACHINE.—G. W. SHARP, 237 Courtland Street, Houston, Tex. In this case the purpose of the inventor is the provision of a device for imparting a smooth and finished surface to cement sidewalks, which will be in a light but strong and compact form so as to be easily transported from place to place.

PHONOGRAPH ATTACHMENT FOR KINETOSCOPES.—P. J. MUKAUTZ, 3804 Wilton Avenue, Chicago, Ill. This invention relates to record holders for phonographs used in connection with kinetoscopes, the phonograph supplying the lines for the actors in the pictures projected by the kinetoscope. Kinetoscope and phonograph move in unison, so that if the record is attached in the proper position with respect to the pictures which appear upon the screen, this correspondence will be maintained in such a way that when the actors are represented as moving about, the phonograph will repeat the words which the actors are supposed to have used.

TRAP.—J. M. KELLOGG, Muscatine, Iowa. This invention relates to an animal trap for catching rats or other animals, and is of that type in which a plurality of animals may be caught successively, without the necessity of the intervention of a human agent for resetting the trap after each catch.

GEARING.—F. W. GRAGE, Port Elizabeth, Cape Colony, South Africa, care of Grossman & Sleicken, Box 884, New York, N. Y. The object of this inventor is to provide a gearing for use on wind mills, deep well pumping frames and other machinery, and arranged to convert rotary motion into rectilinear reciprocating motion, at the same time producing an exceedingly long stroke and insuring a transmission of power with a minimum loss of friction.

SPOOL HOLDER FOR SEWING MACHINES.—ETHEL M. JONES, (nee ELSDEN), Hamilton, Bermuda. In this patent the object of the invention is to provide a new and improved spool holder for sewing machines for conveniently carrying a spool to supply thread to the machine. For this purpose, the holder is attached to the sewing machine frame and is provided with spring-pressed alined trunnions, engaging the bore of the spool, to rotatively support the latter.

GREASE CUP PLUG.—G. H. HUDSON, 1077 Ogden Ave., Bronx, New York, N. Y. This plug is more especially designed for use on connecting rods of locomotive engines, and other machines and parts, and arranged to allow of conveniently filling the cup with grease without removing the plug from the connecting rod or other part of which it forms a permanent fixture.

FILM FIRE SCREEN.—P. H. CASEY, 818 Church St., Lynchburg, Va. The object of this invention is to provide a screen for protecting the films in kinematograph apparatus from fire in case of breakage of the film while the apparatus is in use. With the improvement in place any accident to the kinematoscope that will stop the film will cause the mechanism to interpose the screen between the film and the light to shield the film from the direct rays so that it cannot become overheated.

COKE DRAWING MACHINE.—D. B. STAUFF, Uniontown, Pa. This invention more particularly pertains to means for manipulating and controlling the scraper. It is preferably mounted upon a suitable carriage, so that it may be moved along a track and stopped adjacent the entrance opening to any one of a series of separate ovens. The scraper may be projected into any desired portion of the oven and moved in any desired direction, to withdraw the coke. It is particularly for use in connection with the "beehive" type of oven.

TABULATING MECHANISM FOR TYPEWRITING MACHINES.—G. C. HOSKIN, Mountain View, Cal. This inventor provides tabulating mechanism having selective means for altering the arrested position of the platen with reference to the tabulating stop whereby the above mechanism may be utilized for columns arranged in order to receive numerals in accord with the decimal system; provides means for the tabulating mechanism to position the stop member in advance of relieving the carriage; and simplifies the construction of the mechanism.

BRAKE MECHANISM FOR SEWING MACHINES.—J. L. KLEINMAN, 1822 Madison Ave., New York, N. Y. The intention here is to provide a mechanism for sewing machines, arranged to permit the operator to readily brake the machine by a motion of the knee so that the operator can employ the hands for manipulating the work or for other purposes instead of the hands for braking.

COMBINED CUTTER AND MIXER.—C. S. HARDY, 710 Sixth Street, San Diego, Cal. An object here is to provide a device by means of which a thick substance such as beef tallow can be mixed with a thin substance such as cotton seed oil to make a homogeneous product, i. e., to cut up the thicker substance into such small particles that the resulting product will be smooth and homogeneous instead of consisting of lumps of one substance mixed with the thinner liquid of the other substance.

APPARATUS FOR SCRUBBING AND POLISHING FLOORS.—F. A. MCKAY, care Manton & Hart, Kingston, Jamaica, W. I. The inventor's object is to procure a simple mechanical apparatus whereby the scrubbing and polishing of floors may be quickly accomplished without the necessity of the operator kneeling or stooping, and one in which effective polishing pressure may be exerted upon the polishing brush during its manipulation by the operator.

MOLDING MACHINE.—M. SCHCLECKI, 501 Warfeld Street, Pittsburgh, Pa. The aim of this invention is to provide a simple machine having a swinging cover for the mold normally out of position over the mold to permit access thereto and having means for first swinging the cover into place and for then forcing the mold toward the cover to compress the material in the mold.

Prime Movers and Their Accessories.

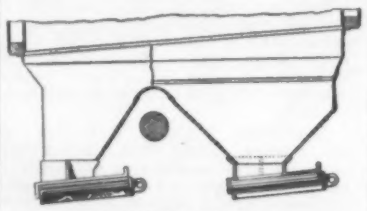
SPARK ARRESTER.—E. G. TAACK, Orth, Texas. This arrester comprises a vertical frame covered with wire netting and attached to a base ring, all forming practically a wire screen drum open at the bottom; a conical frame of same cover, which is attached to the top of the larger frame and suspended centrally within it; a base-ring to which the superstructure is attached, the same being in practice adapted for attachment to the smoke-stack of a traction engine; finally, an annular pan attached to and surrounding the base-ring and serving in practice to receive dead sparks dropping from the arrester proper, and discharging them when operated for the purpose.

CARBURETER.—J. NAMUR, Kinsley, Kan. The invention is an improvement in the class of carbureters having an air-inlet valve adapted to open automatically, more or less, according to the variation of pressure in the mixing chamber corresponding uniformly to the work required of the engine. It controls admission of air and ignitible vapor, so that the proportions of the two always bear a certain ratio.

FLOAT VALVE FOR CARBURETERS.—M. WEIWODA, New York, N. Y., assignor to G. W. STEVENS, 25 Broad Street, New York, N. Y. The special purpose here is to so construct and mount the float and float valve, that it may be readily removed from the liquid chamber without disassembling the latter or without removing any other parts of the carbureter. The float and all parts connected therewith are mounted on a single closure plate covering an aperture in one wall of the chamber, so that by removing the plate, the float and all the liquid level controlling means are removed.

Railways and Their Accessories.

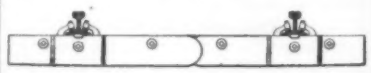
LOCOMOTIVE ASH PAN.—J. F. DUNN, care Oregon Short Line, Salt Lake City, Utah. In this patent the improvement relates to ash pans, and more especially to those used on



LOCOMOTIVE ASH PAN.

locomotives, and has for its object to provide one having a guide member secured to the bottom of a hopper, the guide member having inclined outer slide bearings and depending end members, a door for closing the hopper, having bearing members for engaging the slide bearings on the guide member, and an end member for engaging the upper depending end member, the lower depending end member on the guide member serving to prevent the ashes from falling off the door when closed, and the upper depending end member on the guide member serving to push the ashes off the door as it is opened. The engraving shows an elevation of the invention.

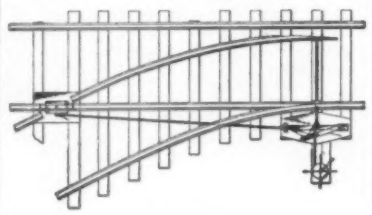
SLEEPER.—G. DORFFEL, 2316 East 27th Street, Oakland, Cal. This invention relates to sleepers adapted for use as cross ties and the like, Mr. Dorffel's purpose being to make the sleeper principally of concrete and give it such form that it may practically be bent. More particularly stated, his invention comprehends two trough-like concrete members



SLEEPER.

connected together by a joint and also by a wooden member extending almost the entire length of the concrete members. It further comprehends various details of construction whereby the rails are secured to the sleeper and the sleeper is straightened in various ways. It also comprises means whereby limited play or slight relative movement is afforded between rails and sleeper, and whereby the latter is especially adapted for use upon railway curves. The engraving shows the sleeper used as a cross tie and supporting a pair of rails shown in cross section.

SWITCH.—C. H. DIMOCK, Box 94, Windsor, Nova Scotia, Canada. The object in this invention is to provide a simple and efficient switch which can be used with railroad and other tracks, in which the rail sections at the switch are continuous when the switch is open or closed, in which is to a large extent



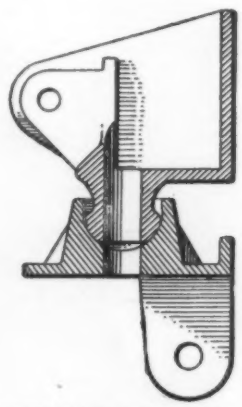
SWITCH.

obviated the noise and wear incident to the travel of rolling stock over the ordinary switch, which is little affected by ice, snow or sleet, which is simple and positive in operation, and in which the rail sections are capable of extended and hard usage. The accompanying illustration shows a plan view of a railroad track switch constituting an embodiment of the invention.

APPLIANCE FOR RAILWAY CARS AND OTHER CONVEYANCES.—H. T. CRONK, 25 West 11th Street, Manhattan, New York. An object here is to provide a receptacle for the collection of refuse which will be located within the car, and thereby avoid the use of unsightly tanks projecting below the car, and also prevent freezing. Means provide for forming an outlet for the gases displaced by the accumulating material in the receptacle, with means for disinfecting these gases.

Pertaining to Vehicles.

SELF LOCKING MAST STEP AND FOOT BLOCK.—R. H. BLACKBURN, 407 Bergen Avenue, Jersey City, N. J. This invention comprehends a mast step and foot block admitting of general use, and of special service in connection with derricks and so disposed that



SELF-LOCKING MAST STEP AND FOOT BLOCK.

a mast or boom is supported by them and adapted to turn into different positions, the parts being arranged so that when the mast or boom is in such position that the members mentioned might otherwise be disconnected from each other by virtue of the strain of the mast or boom, whose members are rendered inseparable, but in another position they are easily separable. The engraving shows a substantially central vertical section through the mast step and foot block showing the mast step occupying one position relatively to the foot block.

NOTE.—Copies of any of these patents will be furnished by the SCIENTIFIC AMERICAN for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.

LEGAL NOTICES

Classified Advertisements

Advertising in this column is 75 cents a line. No less than four nor more than 12 lines accepted. Count seven words to the line. All orders must be accompanied by a remittance.

BUSINESS OPPORTUNITIES

AGENTS: $35 a week for 2 hours work a day selling wonderful new household necessity; new selling plan with free advertising does it. Collette Mfg.Co., Box 80, Amsterdam, N. Y.

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INSTRUCTION

LEARN TO WRITE ADVERTISEMENTS—Earn $25 to $100 weekly. We can positively show you by mail how to increase your salary. Prospectus free. Page-Davis Co., Dept. 89, Chicago, Ill.

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FOR SALE—U. S. Patent No. 980,096, on Straw Hoisting Net. Simple and Durable. Will consider any reasonable offer. For further information, address George Glazer, Halleck, Nevada.

MISCELLANEOUS

ACTIVE SALESMEN easily make $300 monthly selling our perfect dry Chemical Fire Extinguisher; exclusive territory assigned; District Manager Wanted. United Mfg. Co., 1143 Jefferson, Toledo, O.

The Ingenuity of the Toy-maker

(Concluded from page 401.)

a pitman to the toothed traction wheel.

Perhaps no tin toy is so well known as the climbing monkey. No spring is employed in his makeup. He is operated by the action of two cords coiled in opposite directions around a double drum. When the lower cord is pulled it unwinds, turning the drum, so that the other cord is wound up. This makes the monkey climb. Between the two drums are a pair of eccentrics which serve to work the arms and legs. When the lower cord is released the monkey runs down of his own weight, coiling up the lower cord and paying out the upper one.

Another toy which justly deserves a place in Toyland's Hall of Fame is the "Balky Donkey." No doubt many of our readers have seen this cantankerous little beast tear across the sidewalk, the two-wheeled cart and an excited clown careening in his wake. Suddenly the donkey balks and begins to gallop backward at an alarming pace, only to stop with a jerk, presently, and run forward. But it is all deception. The donkey is a mere inanimate puppet, mounted see-saw fashion between the shafts. The mechanism is all in the vehicle, and it is the clown that yanks the donkey up and down by means of the reins. Like the lizard, the reversal of travel is produced by a mutilated crown gear whose teeth engage first a pinion on one side of the center, then a pinion upon the other side. The clown is made to bob back and forth by connection with a crank shaft forming the axle of the two wheels. The head of the clown lolls about in a ludicrous manner because of its ball-and-socket joint with the body.

The "Zigzag" is a ridiculous contrivance which has a most astonishing way of running about the floor in every conceivable direction under the guidance of a black and a white driver who appear to be at loggerheads. It runs on two large wheels between which the body is hung. In order to give it a zigzag motion one of the wheels is intermittently driven at double speed by means of a mutilated gear while the other has a constant motion. The view of the dissected toy shows this mutilated gear in the foreground. The two figures which sit on opposite sides of the vehicle are moved by means of eccentrics which rock their seats. The eccentrics are illustrated in Figs. 4 and 5.

A number of other toys have been devised to zigzag unexpectedly. The "Joy-rider," shown in one of our photographs, pursues a very drunken course by reason of the fact that the front wheels are steered by connection with a cam *M*, as shown in the detail view, Fig. 10. At the same time a bellows *N*, is operated to toot the horn *O*, which the driver holds to his mouth.

In September of each year wholesale importers in this country send their representatives abroad to select samples, not for the coming Christmas, but for the Christmas of the year following. Even before the holiday rush has decided what toys are the most popular, these agents have made their selections, and by the middle of February they have a full line of samples, running into many thousands. Agents are then sent out on the road, and by mid-summer orders have been placed for the new toys of the coming holiday season.

The toy which is hoped to make the hit of next Christmas is a motor cycle adapted to hold its equilibrium by means of a small gyroscope mounted in the frame of the vehicle. This toy is shown in two of the accompanying illustrations. The gyroscopic wheel is set in motion by means of a spring which must be continuously wound until the humming of the wheel shows that it has attained sufficient speed to hold the toy in upright position. The gear train transmits motion to the rear wheel by means of a fine coiled spring as a substitute for a chain running on two pulleys that look like sprocket wheels. It requires a little knack to start the machine properly, but once well started it will run in a wide circle, making several circuits.

Readers' Service.

Hardly a week passes but the Editor receives letters from readers of the SCIENTIFIC AMERICAN *who ask him whether they shall send their boys to a technical school. Whether a boy shall become an engineer, a chemist, or a naval architect are questions that puzzle parents. The Editor will be pleased to aid readers of the* SCIENTIFIC AMERICAN *in deciding the matter of technical education for their sons. Address* EDUCATIONAL BUREAU.

III.—Shall My Boy Become an Electrical Engineer?

By John Ritchie, Jr.

[This is the third of a series of articles intended to set forth fairly the business possibilities of the technical professions. The articles are prepared by men who are connected with the more important technological institutions of this country and who are for the most part prominent educators. Because these teachers have instructed hundreds of young men in the principles of engineering, they are best qualified to write upon a subject so immensely important in the future development of American manufacturing industries.—EDITOR.]

AFTER all, it is a plain question of one business man asking a teacher, or some friend, or the editor of a newspaper: "Will it pay my boy to study at some technical college to become an electrical engineer?"

Of course, no man alive can give the answer and have it apply to everyone. It is a question that means consideration of each different case. There is the eternal human factor. Who is the boy? What is his make-up? What chance has he for a start? What likelihood is there that he can hold on long enough to have given himself a fair chance?

There are plenty of men, speaking with an air of authority, who will assert that all the engineering professions are overcrowded and that the boy to do more than merely fairly well must have powerful relatives or friends who will place him. But, on the other hand, it is perfectly proper to show what the results have been in the past and to ask: Are there similar chances in the future or are they all gone? Those who have an insight into the unfolding fields in which electricity is every day becoming of greater and greater importance, will be loth to admit that all the good places are filled and that there are to be no more.

There is one point about the general technical education of the higher special institutions that is not to be disputed. Edison not long expressed it in the terms:

Engineers are "Usable Men."

"They make usable men." Such a school gives to the student an education that is his capital. The technical education is the one that the poor boy can gain with the certainty that his future will be better assured and that the situations to which he attains will be of greater importance and will pay better than would otherwise have been possible.

There is nothing so easily understood as a concrete example. The recent report of the President of the Massachusetts Institute of Technology gives some figures that are directly to the point. Here is an institution whose statistics show it to be pre-eminently the college of the poor student or of the one in only moderate circumstances. These statistics show that one in every six of its students is receiving aid through one or another of the scholarships or funds. The success of these men in later life has been notable; they are among the country's leaders in the departments in which they have studied. A single example is the recent New York Typhoid Commission, on which the three sanitary experts who are not physicians are a Technology professor, W. T. Sedgwick, and two of his former students. Such cases as these, which can be repeated in all the engineering professions, of the technical student in responsible places, are not the dreams of the future, but the cold facts of today.

In a consideration of success in the matter directly in hand, electrical engineering, it is necessary first to define success, to agree upon some standards by which success or failure may be judged. Two such criteria will suggest themselves to the business man as being eminently sensible: How attractive has the profession proved to those who have chosen it, and what standing in the world have these men attained? Then, of course, there is the question: Has it any future? But this may be dismissed at once, in view of the fact that new fields are developing every day, and that many hundreds of millions of dollars are saved to the country each year through improvements and methods that were not known a decade ago.

The best way to answer the first question, how attractive has the profession of electrical engineering proved, is to present a concrete example, which may be done by use of the figures given in the Massachusetts Tech. Catalogue of the present school year. There are here comparative tables that are well worth the study.

In the score of years from 1885 till 1910 there were graduated at Boston 756 electrical engineers, of whom 24 are dead. Of the remaining 732, 53 have not been defined as to business or profession in the Institute records. There are 49 who have become teachers, 19 have gone into the service of the United States Government, while 477 have remained within the profession for which they prepared themselves in college. This is almost two-thirds of the students who graduated in this course. Their distribution in the different branches of electrical work shows that 260 of them are in business for themselves as electrical engineers; that 112 have taken up some electrical business enterprise, and that most of the remainder are with electrical corporations, telegraph, telephone or street railway or power companies.

This showing has only one interpretation—that the profession is really attractive, because it holds those who are engaged in it. It is so easy in this country for a man to change his calling, particularly easy in engineering, where the foundations of the different branches are so much the same that if the electric engineering profession were on the decline, or if it were merely holding its own, it would be natural to think that those in it would be getting out of it. But, on the contrary, it has here even drawn a little from some of the other engineering professions, and 38 other men of the same institute, not originally fitted for electrical work, have joined the electrical group.

Taking the complete figures, subtracting from the whole number of graduates those who have gone to other businesses, even other departments of engineering, and adding the number that have come into electrical engineering from other departments, there are in the profession a number of Technology men equal to 70 per cent of the surviving graduates of the special engineering course.

It must be very evident here that there has been no great exodus from the profession. The principal losses are the 27 engineers other than electrical, already noted; 49 men gone into other professions and 58 men who have taken up general business, which always has attractions for American men.

Now, a word about the importance of some of the positions. The director of the greatest American research laboratory in professional electrical work at Schenectady is from this group, with at least four general managers of electrical corporations, four local managers and one treasurer. Twelve of the group are connected with railways using electricity, one a president and another a manager, while in the employ of the big companies they may be numbered by dozens. One of the men who have made tungsten possible is an electrical engineer, but from another college, and graduates from the many other technical schools are in other responsible positions near the top.

The Earning Capacity of an Electrical Engineer.

If definite figures of salaries could be given, they would add some evidence, but these are very difficult to secure. In a single class of the institute 152 members have responded to a call for salary figures. Sixty-two men get between $2,500 and $5,000; 31 between $5,000 and $10,000, and 16 above $10,000, two of the last being rated at $50,000. These figures look well, and they show prosperity, but it is difficult to apply them, save in most general fashion, to the immediate question of electrical engineering.

Are the good places all filled? Common sense, with a realization of the ever-increasing use of electricity, would say "No." Evidence here is not altogether easy to collect, but direct to the point are two recent newspaper items. One

man at 31 years of age is announced to be the engineering head of three great trolley companies centering in Syracuse and Utica, to take the place of another who has gone higher, while in Boston another electrical engineer at 37 has found a new place, created for him, second vice-president of the Boston Elevated Railway Company, which uses electricity alone. These are from the same Institute which has furnished the other figures, and naturally represent only a part of the whole story.

With such facts at hand with present conditions and with every prospect of important future developments, one cannot help coming to the conclusion that the profession of electrical engineering offers good opportunities for industrious and capable young men, properly prepared. Experts assert even that these opportunities are not excelled in any other profession or branch of business. It is no easy road for even the best. To be at or near the top in these times means skill, application, hard work and the essential principle of business ability. Even a technical training will not serve to its limit the man who lacks this last-named faculty.

Design of Racing Aeroplanes

(Concluded from page 398.)

The excellent results in the way of speed secured with the two monoplanes just described, in which a slight effort to decrease head resistance has met with a large reward, makes it a certainty that a specially designed speed machine having structural modifications, such as is shown on page 398, would be sufficiently fast to break all records by a wide margin and win the international race for America, if constructed in time this year. Full details of this "SCIENTIFIC AMERICAN Racer," which was designed by Mr. J. Bernard Walker, were published in our Aviation Number of October 20th, 1910. The line drawings shown herewith give a fair idea of this machine. Its chief feature is the dispensing with all guys for the wings and building the latter up upon thin steel girders of I-beam section, a construction which was successfully carried out last winter with an "Antoinette" monoplane that flew. A further reduction of head resistance is obtained by folding the chassis up in the body when the aeroplane is in flight. An oval torpedo-shaped body having as small head and skin-friction resistance as possible is also used. Extremely narrow wings, like those used by Blériot in the last international race, form another feature of this machine. Ailerons at the ends, worked by a gyroscope, are used for transverse balance. The entire framework of wings and body is of steel, the surfaces and fuselage being covered with thin, polished, sheet steel also. A tiny "conning tower" is arranged to cover the aviator's head. When the wheels are drawn up (see dotted lines, Fig. 4) the entire body presents a smooth even surface to the air with practically no breaks. The drawing up of the wheels does away with most of the resistance of the chassis. This resistance, at 100 miles an hour, is a considerable item. In fact, since the power required for support decreases with an increase of speed, it is only the head resistance that has to be given attention. By eliminating this as much as possible when in flight, we are able to obtain the highest speed with a given horse-power. The "SCIENTIFIC AMERICAN Racer" should be able, with a 100 horse-power motor, to beat any of the other monoplanes with one of 140 horse-power.

The lower right-hand drawing on page 398 shows the design of a racer made recently by Mr. E. R. Armstrong. Current practice has been followed in making this design, which has a resemblance to both the Deperdussin and the Morane-Saulnier racers, as can be seen. The design is intended to accommodate a six-cylinder, vertical, water-cooled motor instead of the usual revolving-cylinder "Gnome." With a motor of 120 horse-power a speed of 110 miles an hour is predicted for this machine. Full details on the designing of this racer are given in SUPPLEMENT No. 1893.

If the Aero Club of America is in earnest about retaining the Bennett trophy, its directors would do well to consider the above designs for racers and set about constructing one or both in addition to securing Aviator Weymann, with a Nieuport monoplane, to defend the cup which he so fortunately won last year.

NEW BOOKS, ETC.

The Life of Giorgio Vasari. A Study of the Later Renaissance in Italy. By Robert W. Carden, A.R.I.B.A. New York: Henry Holt & Co., 1911. 8vo.; 367 pp. Price, $4.

Imbued with the decadent ideas of his century, Vasari, in spite of his contemporary fame, can scarcely be said to be more than a copyist of his master Michelangelo. Fortunately for posterity, he used his pen to better advantage than his brush, and has left us three volumes of invaluable history, appreciation, and comment concerning Italian art. Where the works of others were concerned, his eye was marvelously unenvious and discriminating. This clairvoyance, aided by his opportunities for commingling with personages royal by blood and royal by genius, has given us writings of the most enchaining interest. These alone would be excuse enough for an extended biography of their author, but Mr. Carden makes another ingenious point when he argues that Vasari's history of the arts through infancy and youth to manhood leaves them there in the fullness of their mature glory, unconscious of the fact that the shadow of senility had already fallen upon them. This period of decay, the writer further urges, coincides with the sixty-three years of Vasari's own life; hence in Vasari himself we have a human document surcharged with the unsuspected pathos of art's hectic autumn—a period no less significant in its way than the spring and summer of its promise and fruition. This significance is admirably conveyed by the biographer, and is accentuated by many rich plates reproducing the canvases of Titian, Bronzino, and Vasari himself. These exhibit to excellent advantage both the strength and weakness of Vasari's hand. The text is of a free, flowing style, does thorough justice to its subject, and forms a distinct contribution to the accessible literature of Italian art.

The Practical Use of Books and Libraries. An Elementary Manual. By Gilbert O. Ward. Boston: The Boston Book Company, 1911. 8vo.; 81 pp.; illustrated. Price, $1.

The young student of library methods will find this an excellent little primer to start with. It includes a teaching outline for high school classes. The structure, care, and proper use of a book are briefly explained, and the card catalogue is presented, with the method of classification under author, title, and subject. The system of call numbers and the arrangement of books in libraries is plainly demonstrated by tables and diagrams, while succeeding sections take up reference books, the magazines, the use of the library in debating, and the most approved methods of purchasing books.

The Lay-out, Design, and Construction of Chemical and Metallurgical Plants. By Oskar Nagel, Ph.D. New York: Published by the Author, 1911. 8vo.; 206 pp.; 172 illustrations.

The problems which confront the industrial engineer, the manufacturer, and the student are numerous; it is with the object of throwing light upon these problems in their relation to chemical and metallurgical plants that this work is offered. The illustrations are taken, to the last detail, from actual lay-outs and constructions of acid, alkali, fertilizer, brick, cement, gas, and coke plants, of spelter and copper works, and of gold and silver mills. A discussion of general factory design is followed by chapters devoted to particular kinds of plants, and folding inserts give mill plans and machinery installations. Close attention has been paid to the economical transit of material through progressive operations. "The Science of Business" is the title of a final chapter in which the evolution of business system is compared to the successive theories of science in relation to the universe. The essentially economic character of both science and business is insisted upon. "It is the aim of the scientist to conquer with the least possible expense of brain work as much as possible of the unlimited field of truth; it is the aim of the business man to effect the production of values by the least possible expenditure of labor."

The Bacillus of Long Life. By Loudon M. Douglas, F.R.S.E. New York: G. P. Putnam's Sons, 1911. 8vo.; 168 pp.; illustrated. Price, $1.50.

Those who have read fragmentary and garbled accounts of the sour-milk theory and the facts supporting it will no doubt be glad to find in a single volume so concisely-phrased yet so authoritative a history as the one in hand. Its sixty-two illustrations cover human appeal, chemical tests and processes, and the revelations of micro-photography—from the picture of the oldest woman in the world and her son, to the bacilli in a milk-smear as seen under the microscope. The action and effects of soured milk in health and disease, so far as it is known or surmised, is very clearly explained and discussed, and the ease with which the milk may be prepared in the house is demonstrated, together with the necessary appliances and the manner of their use.

Elementary Applied Mechanics. By Arthur Morley, M.Sc., and William Inchley, B.Sc. New York: Longmans & Co., 1911. 8vo.; 382 pp.; including 285 diagrams.

The young student in engineering science has his entrance upon the chosen field made very easy for him in the Morley-Inchley textbook. Numerical calculations precede and in many instances entirely replace algebraic forms, and while the work is in no sense a laboratory handbook, a number of simple experiments are indicated. The book is written from the British standpoint, and adheres in general to the recommendations of the Board of Education.

Notes and Queries.

Kindly keep your queries on separate sheets of paper when corresponding about such matters as patents, subscriptions, books, etc. This will greatly facilitate answering your questions, as in many cases they have to be referred to experts. The full name and address should be given on every sheet. No attention will be paid to unsigned queries. Full hints to correspondents are printed from time to time and will be mailed on request.

(12635) J. F. G. and many others ask if the "Titanic" sank to the bottom of the ocean where she went down. A. Anything heavier than water will sink to the bottom in any depth of water. The ocean is slightly denser at the bottom than at the surface. It is about 1/20 denser at the bottom in the deepest places, that is, no more compressible than water, and a body which is more than 1/20 denser than water will ultimately reach the bottom. If the "Titanic" filled with water, as she probably did, she would be much heavier than that, since she was largely made of iron, which is about 7.7 times as heavy as water. If she had large compartments full of air imprisoned by the water so that it could not escape, it might be possible that she should act like a submarine or the Cartesian diver, and float at some intermediate level. But that is very improbable, since the companionways, the doors, ventilators, and smokestacks when submerged would admit water to every part of the vessel from above and fill all compartments. No ship is water-tight from the top-work. Only the hull is made water-tight from the outside. When this is broken, the water enters below and the air escapes above. The ship is then heavier than water, and goes to the bottom. Most of these inquiries speak of the pressure of the water as so great at a great depth. It may be pointed out that the pressure of the water has no effect upon the sinking of a body excepting that it may compress the body, thus reducing its bulk, increasing its density, and making it sink faster. The reason why the pressure of the water cannot prevent the sinking of a heavy body is that this pressure at any point in the water is equal in all directions, and pushes the body down with the same force as it buoys it up. This is the same with still air. It presses very heavily upon us, but equally in all directions, and we move about in it without thinking at all that it is pressing at the rate of nearly 15 pounds upon every square inch of our bodies. We fall through it with terrific velocity for the same reason. The resistance to falling through water is much greater than through air, of course, and the falling through water is slow, but it is real, and a body will in time reach the bottom anywhere if it is heavier than water. A human body acts in the same manner. It is lighter than water while the lungs are filled with air. It is heavier than water when the lungs are filled with water or empty of air. For this reason the body of a person just drowned sinks to the bottom. In a short time decomposition generates gases in the body, and distends it, which usually brings it to the surface again, if it is not entangled with anything at the bottom. Many bodies are recovered in this manner. We hope this reply will meet the eye of all inquirers about this sad occurrence and prove sufficient. As to the hulls of derelicts which are floating nearly submerged and are a menace to navigation, these are usually laden with some cargo, such as lumber, lighter than water, or they may be bottom up, containing imprisoned air enough to keep them afloat. The U. S. derelict destroyer "Seneca" is maintained by the Revenue Cutter Service for the sole purpose of searching for these wrecks and sinking them. A full account of this important aid to navigation will be found in the SCIENTIFIC AMERICAN, Vol. 105, No. 3, price ten cents.

(12636) W. R. I. asks: What is the explanation for the following phenomenon? I have noticed upon looking out of a car window, when the train has stopped on a curve, the top of the car leaning toward a building, that this building seems to be leaning away from the car on this side and other buildings lean toward the car on the other side. My sense of equilibrium seemingly having been disturbed by the moving train. The buildings seemed to right themselves after the train had been stopped for a short time. Is it possible that such a phenomenon would be experienced by air men in an aeroplane, causing a loss of sense of equilibrium for the time being? A. The apparent leaning of buildings, etc., in the opposite direction to that in which the car in which you are riding or standing is leaning, is an optical illusion of which you can hardly rid yourself, even after you have seen that it is an illusion. You think your car is erect, and so think the building outside the window is leaning, in one direction on one side of the car and in the other direction on the other side of the leaning car, since you compare the building with the window frame. The same effect is produced in descending a steep grade. A level place at the foot of the hill seems to slope up away from you. Doubtless an aviator is under a similar illusion as he slants in one direction or the other, or downward for a steep glide. The ground below seems to him to incline in the opposite direction.

My Greatest Success

By R. E. Olds, Designer

Trainloads of Reo the Fifth

In the past 25 years a dozen models of mine have become the season's sensation.

Again and again I have seen the factory swamped, and men paying a bonus to get my latest creation.

But Reo the Fifth has broken all records. I never saw a demand which compares with this.

Five cities at this writing have *trainload* orders with us—*orders for forty carloads each*—to go in a single shipment.

But the demand is just beginning. Very few men have yet discovered this car.

Soon there will be 10,000 cars in the hands of 10,000 owners. Ten thousand men will be telling others how Reo the Fifth performs.

Then will develop the real demand for this final car of mine.

Not a Passing Sensation

Other season sensations have come and gone. New cars and better came out to displace them.

Those days are over now. Reo the Fifth comes close to the limit in motor car engineering. It embodies the final results of my 25 years of experience. In every detail it marks the best I know.

There is no probability that we shall ever see a materially better car. The years can bring only minor changes.

It Deserves It

This car deserves popularity. That is my satisfaction.

The men who buy it get the utmost of which I am capable. There will be no regrets—none to say I misled him. And none will ever see a car which gives more for the money.

The steel in this car is all analyzed. Every vital part is put to radical test.

Parts are ground over and over, to get utter exactness. Inspection is carried to extremes.

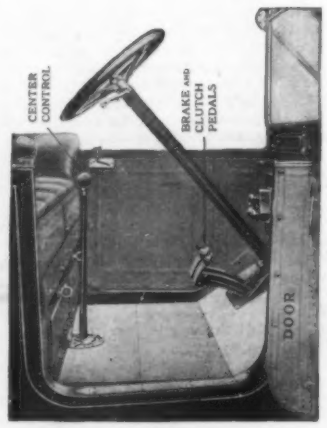
There are big margins of safety. The bearings are Timken and Hyatt—roller bearings, in place of the usual ball bearings.

The tonneau is roomy, the wheels are large, the car is overtired. The carburetor is doubly heated.

The body is finished in 17 coats. The upholstering is deep, the lamps are enameled. Even the engine is nickel trimmed.

Every part of the car shows the final touch—the avoidance of petty economies. I am proud of it. Not an iota has been omitted which could add to the worth of this car.

Center Control—No Side Levers



Then here, for the first time, we get rid of all side levers. All the gear shifting is done with this center cane handle—done by the right hand. It is done by moving this lever less than three inches in each of four directions.

Both brakes are operated by foot pedals, one of which also operates the clutch. So the entrance in front, on either side, is clear.

This arrangement permits of the left side drive. The driver sits, as he should sit, close to the passing cars—on the up side of the road. Heretofore this was possible in electric cars only.

Thus we have solved the last important problems in designing.

Price Still $1,055

The price of this car remains at $1,055, though subject to instant advance. This price is too low for a car like this. It leaves no adequate margin.

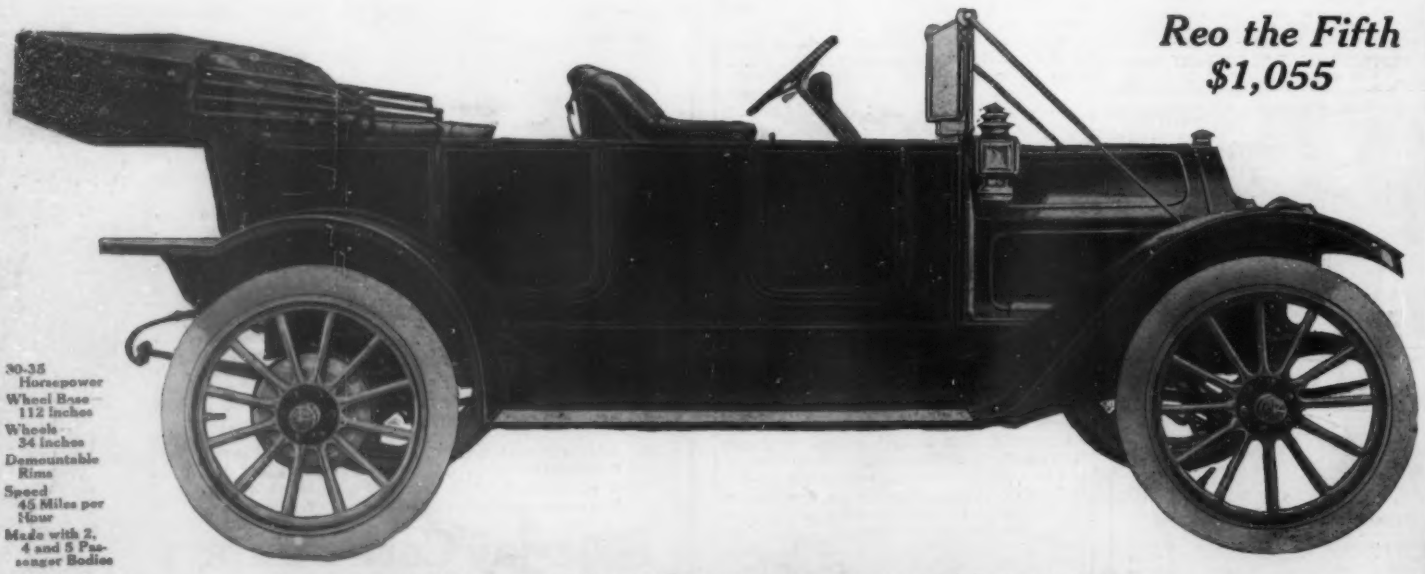
But we shall continue this price, in all probability, until materials on hand are exhausted.

1,000 Dealers

Reo the Fifth is shown by dealers in a thousand towns. We will direct you to the nearest when you send for our catalog. Please write for it now. It shows the various bodies. Address

R. M. Owen & Co. General Sales Agents for **Reo Motor Car Co., Lansing, Michigan**

Canadian Factory, St. Catharines, Ontario.



Reo the Fifth $1,055

30-35 Horsepower
Wheel Base 112 inches
Wheels 34 inches
Demountable Rims
Speed 45 Miles per Hour
Made with 2, 4 and 5 Passenger Bodies

Top and windshield not included in price. We equip this car with mohair top, side curtains and slip-cover, windshield, gas tank and speedometer—all for $100 extra. Self-starter, if wanted, $20 extra.

(70)